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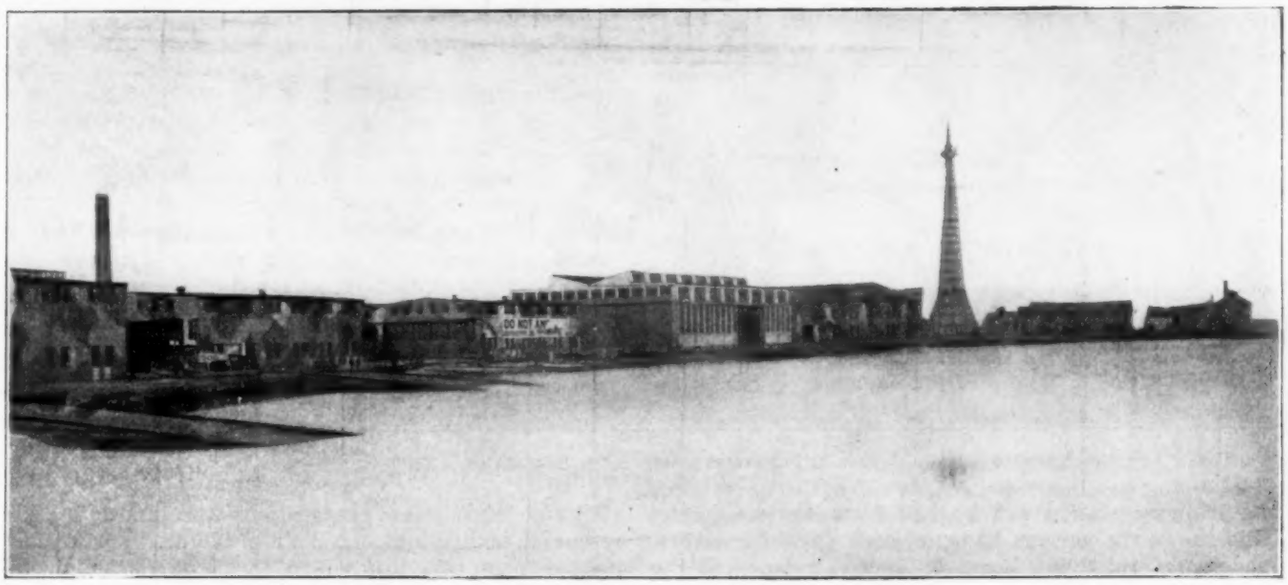


The Naval Air Station at Pensacola

BY FRED H. COLVIN
Editor, *American Machinist*

ALTHOUGH we are most apt to think of the air service as being connected with the Army, we must not overlook the fact that thousands of naval aviators were trained during the war, many of them at the Naval Air Station at Pensacola, Fla. It is also well to remember that when it came to securing practical airplanes for war service, the Navy made by far the better showing, utilizing the experience of the best builders instead of waiting in the attempt to develop an entirely new plane.

It's a far cry from the sailing vessels in use when the Pensacola Navy Yard was established, to the submarines and aircraft which now use this yard as a base. The yard is admirably located and is now well equipped for its new work.

Pensacola as a naval station dates back many years, but in common with our other naval establishments it grew tremendously under the urge of war activities. It is now so different from Civil War days that Admiral Farragut and his fellow officers would feel entirely out of place. For the latter activities of the yard at Pensacola have been almost entirely confined to submarine or undersea ships, and flying boats or oversea aircraft. Located on a comparatively shallow bay and protected to a great extent from the storms of the Gulf of Mexico by outlying islands, it affords an excellent place for naval air training. Some idea of the appearance of

FIG. 1. HAULING PLANE UP WITH TRACTOR

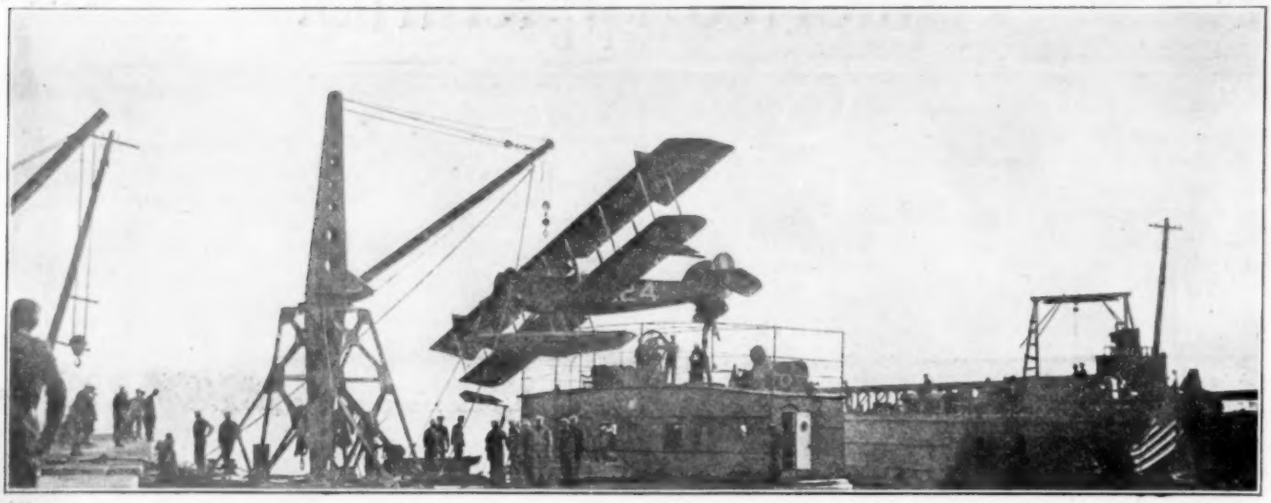


FIG. 2. THE SALVAGE BARGE—"MARY ANN"

the training station can be had from the headpiece. This shows the various hangars, each of which accommodate several flying boats or hydro-airplanes as the case may be, and it also shows the high observation tower from which an officer keeps his eagle eye on all the men in the air so as to be able to report instantly if anything goes wrong. Should he see a plane fall, he telephones instantly to one of the fast sea-sleds which are always ready to go at a thirty-mile clip to the aid of any fallen flyer. Immediately thereafter, the scow shown in Fig. 1, and familiarly known as the "Mary Ann," starts after the fast-speeding sled to rescue the airplane or boat from its watery resting place. In the illustration shown it has just returned with a hydro-airplane which is evidently very little damaged. Although not staged for my benefit, a small plane "crashed" or nose-dived into the bay during my visit and immediately preparations were under way for rescue of both the men and the machine. Fortunately, neither man was injured in the least, although the plane sustained considerable damage to the wings and pontoons.

Another view, Fig. 2, taken from the beach and looking out over the bay shows the way in which one of the large flying boats is handled from the water to the hangar. The boat body is floated over a small car, which is shown better in Fig. 3, and a small Cleveland tractor of the crawler type hauls it up the incline and helps get it in position in the hangar. These little tractors are found very convenient in many ways in handling aircraft of various kinds in and out of their hangars.

Fig. 1 also gives a good idea of the twin-motor flying boat of the type built at the Philadelphia Navy Yard, the new naval aircraft factory which was built in such

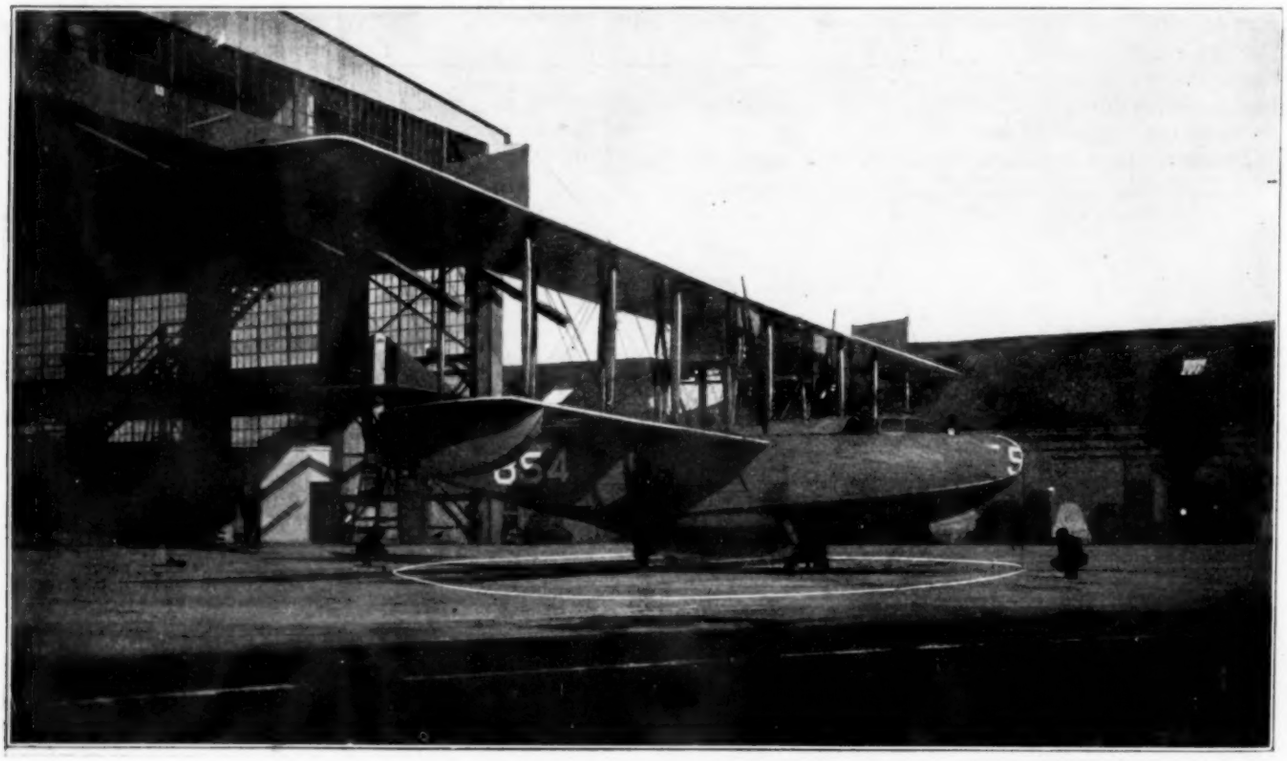


FIG. 3. TESTING OR "SWINGING" THE COMPASS

record time during the war and which turned out large numbers of these boats before the signing of the armistice. The men around the hull and also up between the motors give a good idea of the size of the whole craft.

Navigation of the air is in many ways more difficult than navigation on the sea, a reliable compass being one of the first essentials. Fig. 3 shows one of the flying boats being swung to various points to test the accuracy of the compass which has been installed for the guidance of the pilot. As all these compasses are of the magnetic type it is necessary to test them with reference to magnetic material in their vicinity and to correct any local attraction by means of small correcting magnets which are supplied by the makers of the instruments. For this purpose a circle was laid out on the concrete pavement in front of the large hangar and the points of compass carefully determined and marked on it. The plane is then wheeled into the center of the circle and swung until its nose and tail point North and South and the compass examined and adjusted for this position. The whole ship is then swung to other positions and tested and corrected in a similar manner at the various points. The care with which the ships are located so as to point in exactly the proper direction, can be judged by noting the use of plumb-bobs at both the nose and tail of the ship.

This view also shows something of the normal construction of the hangars in order to secure a clear opening for handling the aircraft in and out. The huge doors fold back entirely out of the way and in addition to this the I-beams, which form part of the framework for the front over the doors, are hinged at the top and swing up to one side so as to be entirely out of the way when the ships are being taken out or in. Two of these beams, swung nearly to their upper position, can be seen in Fig. 3 behind the end struts almost directly over the ship's number, 854.

Dirigible Hangars

In addition there are also large dirigible hangars, although neither of them is capable of housing ships of the R-34 type. These are extremely interesting structures and give some idea of the progress which has been made in air navigation.

One of the important features of the plant is an instrument repair room in charge of an expert instrument maker who not only keeps compasses and similar instruments in good order, but has also designed and built others for special purposes. The yard is under the command of Captain Harley H. Christy, assisted by an able corps of both reserve and regular officers, not forgetting the many airplane mechanics who keep the airplanes and motors in serviceable condition.

An Expanding Punch for Aluminum Ware

By Frank A. Stanley

The sheet metal utensil at the left in Fig. 1 is one of a line of articles manufactured by the Aluminum Products Co. in their plant at Oakland, California.

This piece of aluminum ware is about 6 in. in diameter and around its cylindrical body there are a series of twenty flats slightly over 1 in. in width. These flat surfaces are produced by means of the collapsing and expanding punch shown at the right which, after being expanded into the walls of the sheet-metal shell, is automatically collapsed to permit its removal upon the upstroke of the press.

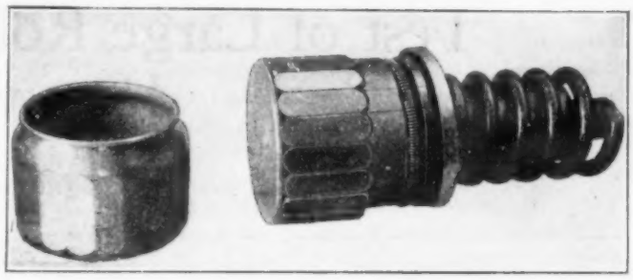


FIG. 1. THE EXPANDING PUNCH AND THE WORK

The aluminum shell is drawn up in a toggle press, double acting, and in three sets of dies. The final operation on the article is the spinning of the neck and the shaping of the top which is accomplished in a regular spinning lathe with suitable forms and tools.

The expanding press tool consists of a central body *A*, Fig. 2, a set of jaws or punch sections *B*, which are held together in cylinder form by two coiled springs as shown, a spring actuated pad *C* at the lower end, a rear pad *D* at the upper end and two springs *E* and *F*, all of which parts, with the exception of spring *E*, are shown in the assembled unit Fig. 1.

It will be seen that the lower end of the central punch body is tapered slightly and that this taper corresponds to an internal taper formed on the expanding jaws. The two springs coiled around the ends of the jaws or punch sections tend always to close the sections to the smaller diameter as permitted by the taper portion on the central body or shank. When the sections are down over the lower end of the central body they close and are in position to enter the work which is held in a suitable die on the press bolster. When the press ram descends the circular pad at the lower end presses back against its spring and as the punch sections cannot descend further, continued downward motion of the press forces the taper end of the body *A* against the taper in the punch sections and causes the latter to expand into the wall of the vessel, thus producing the series of flats around the shell. With the following up stroke, the stiff pressure spring *F* behind the punch sections holds them down until the central body has lifted sufficiently to allow the sections to collapse around the shank, in which position the entire device rises out of the work.

The thin pad *C* acts as a pressure pad to hold the work as the punch descends and to prevent it from lifting on the up stroke of the press.

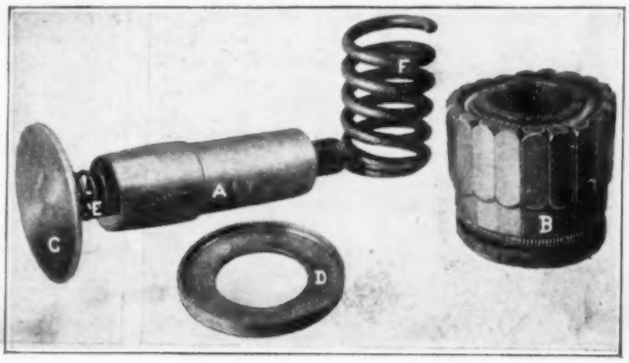


FIG. 2. COMPONENT PARTS OF THE EXTENDING PUNCH

Test of Large Roller Bearings Under Heavy Loads

By G. M. BARNES
Lieutenant-Colonel Ordnance Department, U. S. A.

The rollers in these bearings were 4.9 in. long by 1¼ in. in diameter—16 in a cage. The inside diameter of the inner casing was 7 in. From the observations and measurements taken it is concluded that this bearing could be safely used up to the total load of 800,000 pounds at which tested.

THE Ordnance Department, U. S. Army, has recently designed equipment which will employ large roller bearings. These bearings will be used under very heavy loads. Very little actual data could be found on this subject and the various roller bearing companies hesistated to state the maximum loads under which roller bearings of this size could be used.

A test of a roller bearing of the size required was therefore made at Watertown Arsenal, Watertown, Mass., using the large Emory hydraulic testing machine at that plant. The roller bearing used in the test consisted of a cage of sixteen rollers, each 4.9 in. long by 1¼ in. in diameter. The inside diameter of the outer casing was 11.25 in. and the outside diameter of the inner casing was 8.75 in. The inside diameter of the inner casing was 7 in.

The method of applying the loads to the bearings and of measuring the torque is clearly shown in Fig. 1. The bearings, axle and a lever used in the test are shown in Fig. 2. The starting loads were obtained by means of a large dial spring balance fastened at the end of a lever 120 in. long. This lever fitted over the top of the axle which is 7 in. in diameter, and which served as a bearing for the three sets of roller bearings held in the fixtures secured to the testing machine. The rollers were well cleaned and lubricated and care was taken that the pull was always at right angles to the lever.

The loads were applied in increments of 50,000 lb. and the forces at the end of the 120-in. lever were read and recorded through an angle of 72 deg. Three readings of the starting forces were taken at each angle of 12 deg., thus making a total of eighteen readings for each increment of load applied.

The average of each group of readings at each of these six points was recorded and the average of these six was taken in computing the average torque. After each increment of 50,000 lb. above 150,000 lb. load, the bearings were taken out, examined and the rollers and casings carefully measured to detect any deformation which may have occurred.

It will be noted that, although three sets of roller bearings were used in the test, only one set was tested under the loads given in the table. The other two bearings each carried one-half of the total load.

Two tests were made. During the first test the loads were run up to about 450,000 lb., at which point the rollers started to indent the inner and outer casings.

RESULTS OF ROLLER-BEARING TEST

Load Applied W	Fa	Fmin	Fmax	Ta	Tmin	Tmax	u
50,000	3.50	3.10	4.00	420	372	480	0.001050
100,000	3.50	1.83	5.16	420	216	611	0.000520
150,000	4.25	2.50	6.00	720	720	720	0.000425
200,000	7.00	4.50	9.50	840	540	1,140	0.000520
250,000	13.70	8.62	18.70	1,644	1,034	2,200	0.000820
300,000	15.72	10.11	20.22	1,884	1,212	2,424	0.000783
350,000	13.80	11.24	16.32	1,656	1,244	1,956	0.000590
400,000	19.36	15.36	15.28	2,316	1,824	2,762	0.000720
450,000	20.83	18.44	23.21	2,496	2,208	2,784	0.000690
500,000	30.70	25.65	35.67	3,684	3,172	4,272	0.000920
550,000	36.90	34.10	39.76	4,428	4,092	4,760	0.001010
600,000	44.30	38.76	49.78	5,316	4,644	5,976	0.001100
650,000	55.70	48.42	63.10	6,684	5,808	7,572	0.001290
700,000	82.27	80.32	84.21	9,872	9,638	10,104	0.001760
750,000	103.90	95.50	112.50	12,480	11,460	13,500	0.002080
800,000	144.30	128.60	160.00	17,316	15,432	19,200	0.002700

NOTATION AND FORMULAS

W — Load applied in pounds.
Fa — Average starting force in pounds.
Fmin — Minimum average starting force in pounds.
Fmax — Maximum average starting force in pounds.
Ta — Average starting torque in inch pounds.
Tmin — Minimum average starting torque in inch pounds.
Tmax — Maximum avetage starting torque in inch pounds.
Rc — Distance of center of rollers to center of bearing in inches.
r — Radius of rollers.
u — Coefficient of friction (calculated).

$$Ta = 120\,Fa$$

$$\frac{Ta}{Rc} = \frac{Wu}{r}$$

$$u = \frac{rTa}{RcW}$$

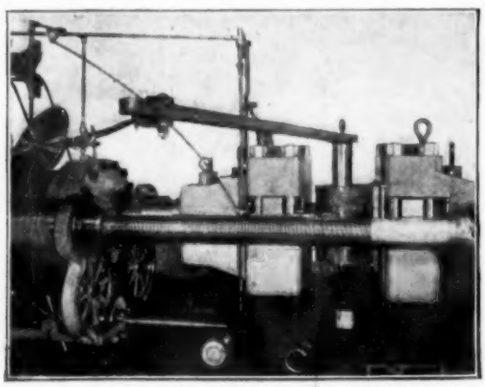


FIG. 1. SET-UP FOR TESTING ROLLER BEARINGS

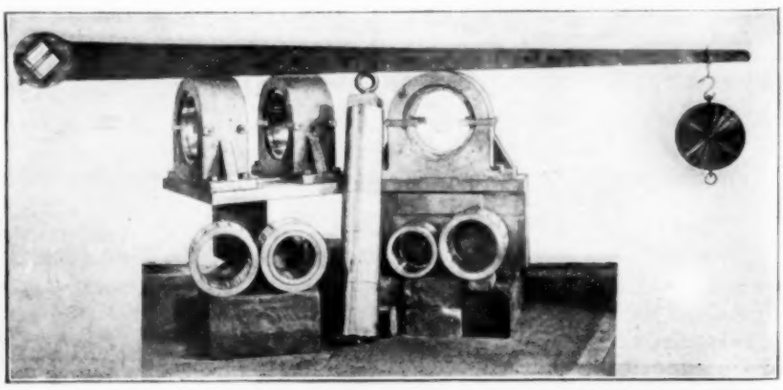


FIG. 2. THE BEARINGS WHICH WERE TESTED AND PART OF THE TESTING EQUIPMENT

These indentations increased perceptibly as the loads were increased. A maximum load of 800,000 lb. was applied to the bearing, at which the coefficient of friction was computed to be 0.0055. It was concluded that the inner and outer casings were too soft. Measurements showed the rollers had not been damaged.

The test was then discontinued and new casings were manufactured, having a sclerescope hardness of between 96 and 100. The test was then repeated and the results of this test are shown in the table.

Careful measurements were taken of the rollers and casings after the maximum load of 800,000 lb. had been applied. No deformation of any of these parts could be found. The table shows that at 800,000 lb. load, the coefficient of friction of the bearing was 0.0027.

From the observations and measurements taken during and after the test, it is concluded that this bearing could be safely used up to the total load of 800,000 lb., at which tested. The three bearings used for the test were unharmed and will be used in service under loads of about 300,000 pounds.

The Problem of Your Schools

By Laurence Parker
Vocational Co-ordinator, Woodward Technical High School, Toledo, Ohio

You will have, in your city, just the kind of schools that you desire. They will turn out just the grade of students that you want them to. If you are indifferent as to their management, they will turn out an indifferent product.

Now what sort of product have the schools turned out? It averages way below a marketable grade. Of the thirty-eight millions in this country who work for wages and on salaries, few have been trained for the work they are doing. Yet most of them were at school for several years. Less than 1 per cent are really trained. Most of what training they have was received in the "school of hard knocks" after they left school. Of all the thirty-eight million, the number who rise above the plane of shallow thinking, indifferent effort and inefficient service are so few that the percentage is not worth calculating.

Now if a factory should turn out such an unmarketable product, there would be an investigation made, provided there was time to do so before the receiver took charge. What is wrong? Why is the product so little adapted to present day needs? The educational system is founded upon the needs of days gone by. It is planned to give what used to be known as "cultural" rather than practical education. It has a program planned to prepare a boy for high school, college and the "learned" professions.

Of course every boy and girl should be given all the help possible that they may secure higher education. But how many boys and girls of today can avail themselves of this higher education? How does this program fit present day conditions? Industry has changed our whole manner of living and earning. The great need today is for men and women trained in the fundamentals of business. The professions are overcrowded.

Less than 50 per cent of those who reach the seventh or eighth grade go to high school. So over half go to work with only high school preparation in their heads. Then only 10 per cent of those who start high school ever finish. The others, without industrial training, go out into the world to sink or swim. Like true Americans they usually overcome the handicap and swim.

Some one has said that it is unfair to pave the road to the white-collar position and leave the way to the overall job a faintly marked trail. It is not only unfair but it is unprofitable as well. When the hard-headed men of business become active in school management, bringing with them the things that have made their own businesses successful, there will be more schools to train boys and girls for life *as it is*. They will be schools for successful life instead of comparative failure. Guy Bilsland says, "The problem is to teach life, not Latin; to teach him to work, not to worry; to produce, not to perambulate."

In the vocational schools of the modern sort, an attempt is made to give practical work somewhat as we describe. It is pioneering as yet. There are few practical text books, and few trained teachers. There is a great scarcity of school administrators who have the vision and who realize the needs of the majority of the boys and girls in your schools. These problems of education are being discussed in the educational magazines and at the educational conventions, where no doubt such discussions do great good. But if we are to have schools to fit these boys and girls for industry, these problems must be fully discussed in the magazines of industry and the help of the leaders of industry enlisted in the management of the school systems.

Holding Very Small Pieces For Turning

By S. Harmer Knight

The following idea helped me so neatly to solve an emergency problem that I believe it worth passing on for the benefit of your readers.

A number of small idler pulleys of german-silver ½ in. in diameter by $\frac{3}{32}$ in. thick with a $\frac{3}{16}$-in. hole and a round-bottomed taper groove $\frac{3}{32}$-in. wide and deep, had to be made in the shortest possible time.

They were turned to size from german-silver rod, drilled and cut off as plain washers so that they could be mounted separately on a spindle, trued with the hole.

A special round-nosed tool was carefully shaped, under a high-power magnifying glass, for clearance and free cutting, but with the well known resistance of german-silver, I expected difficulty in holding such small pieces against the thrust of a grooving tool.

There was not time to solder each piece independently to the spindle and, after grooving, to remove it, clean off the solder, and remount and re-center the spindle; so some other method had to be devised.

The chucking spindle was turned from ¼-in. drill rod, shouldered to fit the hole in the washers, and the end threaded for a number 2-56 common hex brass nut. This of course would have very little binding power on the washers, but it occurred to me that if the face of the shoulder was nicked up so as to form teeth like the surface of a number 2-cut file, pointing forward in the direction of rotation, and the washer tapped up against this surface, the nut, small as it was, would hold it.

The results proved entirely satisfactory, as the pulleys were finished easily and quickly, with no marring of any account from the spindle, which was not even hardened for the purpose.

This makes a simple and convenient method for chucking washers of any kind which need to be reduced in size—a not infrequent necessity.

Garvin No. 3 Duplex Slot-Milling Machine

By C. J. PRIEBE
Associate Editor, *American Machinist*

Railroad shops, in addition to making ordinary repairs to locomotives, produce many new parts that have heretofore been ordered from the builders. Some parts, such as crossheads and piston rods, must be slotted for taper keys, and unless machines adapted to the job are at hand such work is very tedious.

A LARGE-SIZED slot-milling machine, especially designed for cutting cotter slots in locomotive crossheads and piston rods, is made by the Garvin Machine Co., Spring and Varick Sts., New York City. The machine mills both sides of a slot simultaneously, the work reciprocating and the cutters feeding inward intermittently. When milling slots entirely through a piece, one cutter automatically retreats before the two cutters meet, and the other one continues to advance and complete the slot.

Method of Holding the Work

The work is mounted in a fixture on the table, the accompanying illustrations showing a locomotive crosshead mounted on the mandrel *A* in the fixture *B*. The The same fixture can be used for any size of crosshead by employing a suitable mandrel. The mandrel is clamped rigidly by tightening the nuts holding down the hinged cap of the fixture *B*. An angle-block *C*, Fig. 2, on the table supports the overhanging crosshead, a wedge being fitted in the guide-ways of the head so as to prevent rotation. The wedge can be placed on either side of the block, so that either a right- or left-hand head can be slotted. The slanting position of the crosshead is necessary because of the fact that the slot must be cut at an angle to its vertical axis.

The same fixture *B* is used to hold the piston rod while slotting, one of the rods already slotted being shown in front of the machine in Fig. 1. By means of suitable bushings, any diameter of rod can be held. Because of the fact that the slot in the piston rod is required to be at a slight angle to the center line of the rod, the fixture *B* can be swung slightly by means of a special tongue fitted to the table slot.

The Table Motion

The table is mounted on a saddle bolted to the bed of the machine. Its motion is derived from the driving motor to be seen in Fig. 2, the train of gears shown providing the necessary speed reduction. No gear-shift mechanism is provided, the speed of the table being changed by varying the speed of the motor and by changing the gears in the train.

The gear train drives a worm and wormwheel running in a bath of oil, the shaft of the wheel being held in the bracket *D*. The wormwheel carries a crankpin, on which is mounted a hardened block fitted in a hardened slot on the bottom of the table and at right angles to its length. Rotation of the wormwheel causes the table to reciprocate, the length of stroke being varied by changing the position of the crankpin in relation to the center of the wheel, a scale on the side of the table showing the length of the stroke. The longest stroke obtainable is 10 in. The table is run for most work at a mild-stroke speed of 18 in. per min.

Cutters of the fish-tail type are used in the machine.

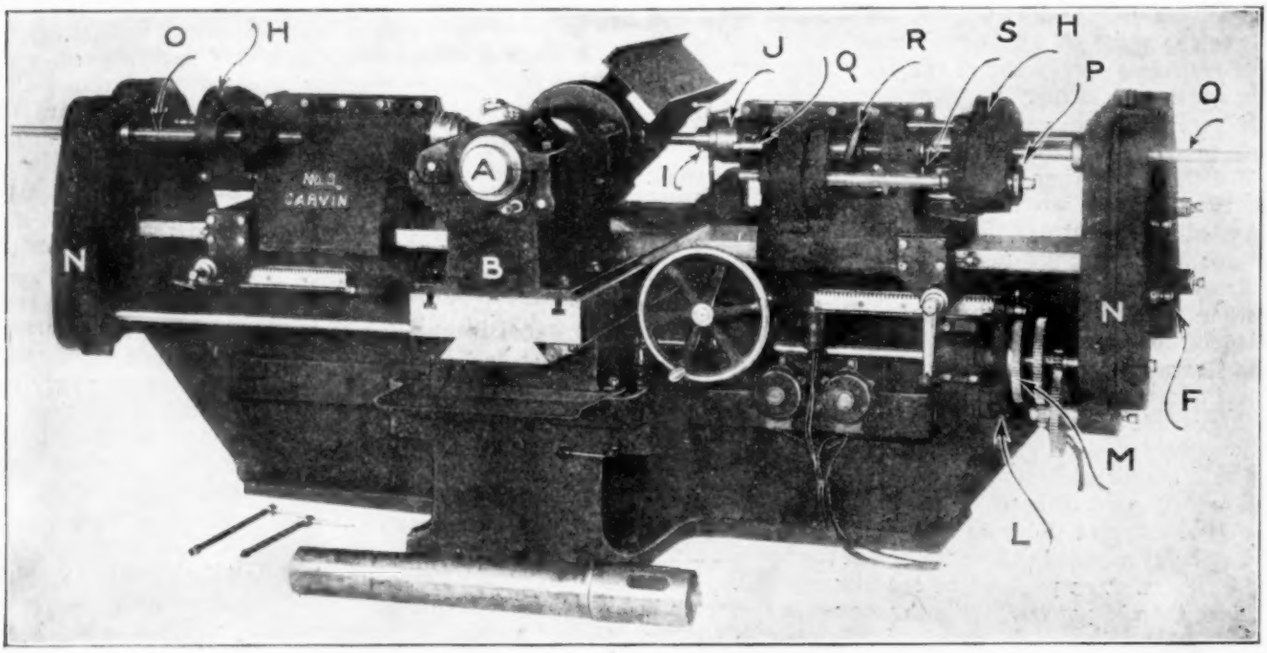


FIG. 1. FRONT VIEW OF SLOT-MILLING MACHINE

Specifications: Size of cutters used, $\frac{7}{8}$ to $2\frac{1}{2}$ in. Table: size, 21 by 87 in.; maximum travel, 10 in. Swing: over table, 30 in.; over bed, 12 in. Spindles: taper hole, No. 11 B. & S.; maximum distance between, 41 in. Spindle sleeves: diameter, 6 in.; length of bearing, 24 in. Feed: total per spindle, 6 in.; per table stroke, 0.01 to 0.025 in. Motors: speed, 650 to 1,950 r.p.m.; horsepower, 5. Length of bed, 128 in. Floor space, 100 x 190 in.

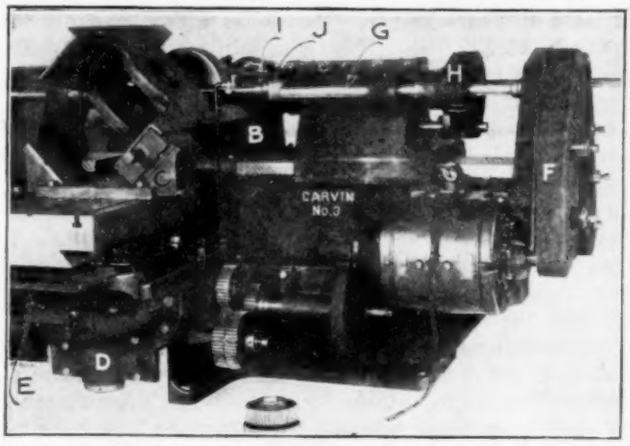


FIG. 2. REAR VIEW, SHOWING TABLE DRIVE

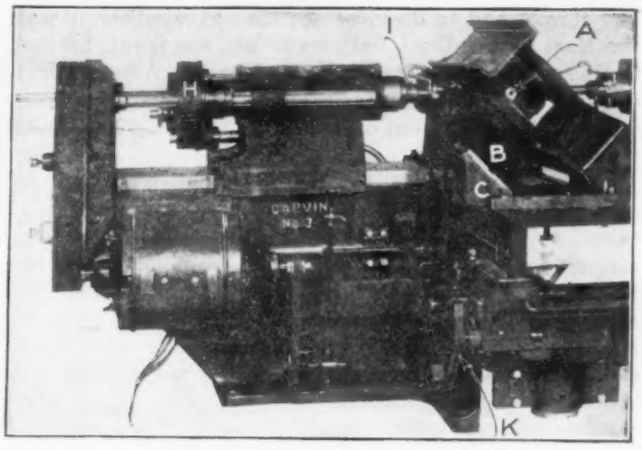


FIG. 3. REAR VIEW, SHOWING FEED DRIVE

The spindles and headstocks are duplicates as far as the drive is concerned. As can be seen from Figs. 2 and 3, each spindle is driven by a separate motor mounted at the back of the machine, the motors being of 3-to-1 variable speed and of 5 hp. each. They are started and stopped by push buttons, and the speed of each is controlled separately by rheostats on the front of the machine. In case of accident to either one of the motors the other one will stop automatically. The drive is transmitted from the motor through a train of gears, inclosed in the cover *F*, to the splined shaft *G*, from which a pair of gears in the housing *H* drives the spindle *I*. The cutting speed is ordinarily 70 ft. per min. The spindle runs in the quill *J*, which slides in the headstock, providing a feed of 6 in. for the cutter.

To accommodate work of different sizes the headstocks can be moved along the bed by means of the hand lever and racks shown in Fig. 1. When taking a cut, however, the headstocks are locked in position. Stops are provided, so that the headstocks can be returned to position after being run back out of the way.

The Feed

The feed of the cutters takes place at each end of the table stroke, being between 0.01 and 0.025 in. It is derived from two wedge-shaped blocks on the bottom of the wormwheel, the blocks pushing down one end of a pivoted arm and thus causing the double-armed lever *K*, Fig. 3, to rock. The lower arm of *K* imparts its intermittent motion through links to the arm *L* (Fig. 1), the swing of which can be adjusted so that the pawl at its upper end moves over different numbers of teeth on the wheel *M*.

The ratchet wheel *M* fastened to the long shaft transmits the feed motion to both heads. When the pawl is disengaged from the teeth of *M* the feed may be operated by the handwheel on the front of the machine, both spindle sleeves being operated simultaneously. The gears shown at the right in Fig. 1 are for the purpose of providing an automatic stop for the feed, and by means of them the feed can be tripped at any desired point. The motion of gear *M* and of the long shaft is transmitted through trains of gears in the housings *N* to the splined shafts *O*.

Since the method of feeding the spindles is the same on each head, reference will be made only to the head shown on the left in Fig. 1. The shaft *O*, threaded on its inner end, rotates in a nut on the headstock, so that, when turning, the spindle quill slides in the head.

When slotting crossheads the mandrel *A* is first put in position, the cutters are brought to the depth to which it is desired to feed them and the trip mechanism is set. After the cutters have been run back and a crosshead placed in the machine, the motors are started, the cutters advanced by the handwheel, and then the pawl is dropped down to engage the power feed. Upon completion of the cut the pawl is automatically thrown out by the trip, and the cutters are run back by the handwheel.

Feed-Reversing Mechanism

When slotting through solid work, as in a piston rod, the mechanism shown on the right head in Fig. 1 comes into action. By means of the knob *P* the gears inside the cover are put in mesh, thus causing the hollow screw *Q* to move toward the right. The threads of the shaft *O* do not engage the sleeve *Q*, but have clearance on the inside of it. When the cutters have advanced close to each other the top of yoke *R* strikes a stop, which causes the bottom of the yoke to strike a lever and disengage the latch *S* which holds the feed nut in place. The screw *O* then strikes the bottom of the hollow screw *Q*, which is still advancing. Thus *O*, the nut and the spindle quill are all pushed to the right, so that both cutters move in the same direction and the left one finishes up the slot. The feed stops as soon as the pawl is automatically disengaged. When the spindle quills are run back by means of the handwheel, the latch *S* again engages the nut and holds it in position. Proper timing of the release of the nut and of the contact of the two feed screws is obtained by adjusting the action of the mechanism before the piston rod is put in the fixture *B*.

It should be noted that all motions are positively driven. The bed and saddle are provided with troughs for collecting the cutting lubricant, which is circulated by the pump shown in Fig. 3. The machine, known as the No. 3, is capable of slotting the largest locomotive crossheads, and it is adapted to other work such as cutting keyways and slotting fork ends.

The New Adventure

By Entropy

Every generation has its proportionate share of men who must, in order to be happy, discover something. If the discovery of that something is attended with risk of neck or pocketbook, it is all the more alluring. Colum-

bus simply had to discover something; whether it was the East or the West Indies was not the point, he had to discover. Peary had the same need. America had already been discovered, Stanley and Livingstone had taken all the "new" out of Africa, so naturally he turned to the North Pole.

Geographically, we are pretty well caught up on exploration, and while we are waiting for the transportation problem to Mars to be arranged we must have something on which our pioneers and explorers can use their energies. A fertile field is right here in our midst, one that the explorer can work over for many years to come and leave unexhausted. There need be no physical danger, but there is real risk to the pocketbook and some danger to reputation.

The Field for Investigation

The field for investigation is here about us, going past us every minute in every crowd. Stand on any business corner, 42nd St. and Broadway, if it seems better, but even a country store will give one a lifetime's work. Look at the people. Some of them will develop. Some will work and become wealthy. Some will become wealthy with no apparent effort. The rest just sort of trickle through the seive and we never hear of them. We all know that chance has a great deal to do with the future of a great many of these unsuccessful people. We know that if they were put in the right environment many of them would become successful. We do not know which ones. Is there a more enticing field for exploration than this? What young man is there that would not agree to split even on all that he made over ten thousand dollars a year with any one who would train him to earn it? And there are a lot of men earning it who did not hope when they were young ever to see ten thousand dollars except through the grating of a cashier's window. You may spend a few thousand dollars on one man and have nothing but a puffed up windbag as a result, or you may spend a few hundred and begin to get returns at once. It's a big risk, but does not that make it all the more worth while?

Means of Developing Men

All the large companies are doing something of this sort but they are trying to play safe. That is, they do not spend much money on a man until they feel pretty sure of him. Take a young man, put him through college or engineering school, put him in the factory to find his level, and he may find it many strata lower than he would if he were given the right encouragement. It is the difference between treatment by discouragement and treatment by encouragement. Many employers say that that is the first thing they want to know, "Has the man courage?" Courage is a matter of environment. Who would not be courageous in business if he knew he had the United States Steel, or the General Electric, or International Harvester back of him? And how many men with responsibilities on their shoulders would be courageous when spending the money of these firms if there were any uncertainty as to what their backing would be?

Suppose that only one-quarter of the men selected and taken on for training and building up come out to advantage, will it pay to do it? Suppose that we consider that the least that we will call success is the increase of annual earning capacity a dollar a day. The average young man at 21 years of age may be expected to live at least 40 years longer. His dollar a day amounts to a salary of $12,000. This is a minimum for only 25 per cent of the men, which amount we will assume will succeed. It is certainly safe to say that the four men among whom one is found who achieves this very little advance in income will not have cost $2,000 each, for the other three will not have been the subject of experiment very long. The risk is there however. If the course is not character building, if it is purely technical, then it had better have been left to the schools; but our manufacturers and other business men as well, are finding that the man direct from school is not ready to take a worthwhile part in their organizations without further training, not merely in the technical branches of industry, but in the ethics of business. Unfortunately, colleges, even those which have strong courses in economics and sociology, do not seem to make a very close connection between the boys themselves and the business and social world. They seem to study it as if the students were to remain innocent bystanders.

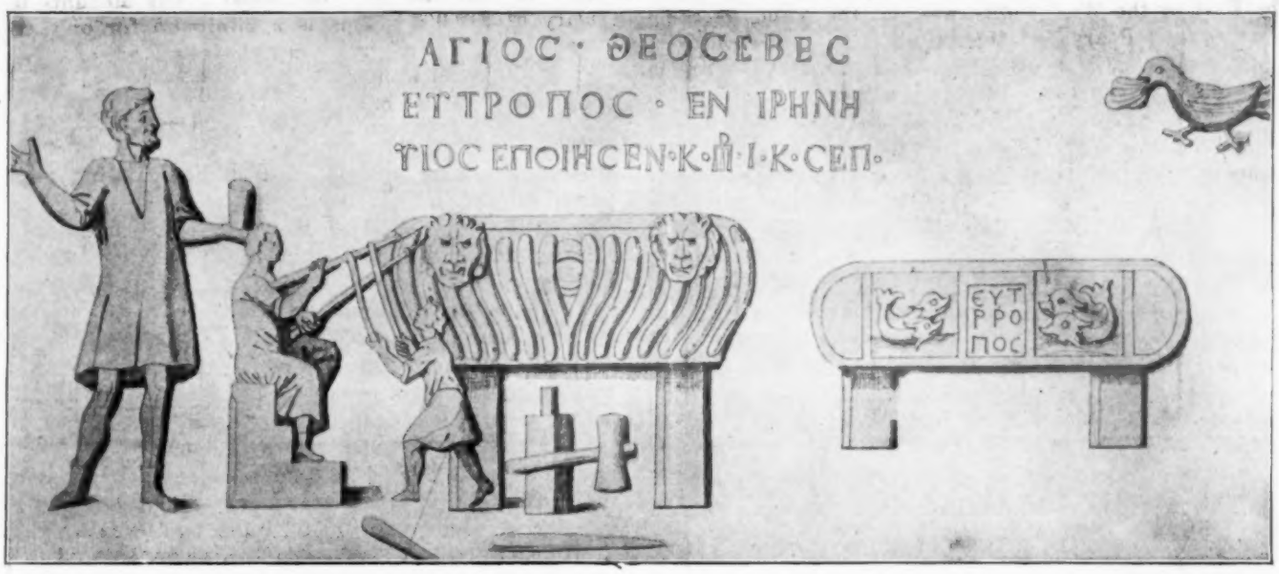
Details of the System

How can a venture of this kind be carried out? What is the ship on which the adventurer is to make his voyages? One shop is not enough. A man may succeed in the first thing in which he is placed; but to our explorer, the fact that he achieves a measure of success only makes him suspect that he might make more of a success elsewhere. It is like speculation in stocks or anything else. Selling out and seeing the market go higher is a doleful game. And if the candidate is a failure in the first trial, why throw him away? Why not try him in another shop under a different boss? For we have to admit that many of the successful men we meet every day would not have been worth anything under certain other employers. It is a question of fitting the man in where his surroundings are congenial and where he can take root and grow.

The voyager into these unchartered seas must have behind him firms which have the facilities for giving his proteges the opportunities which he demands for them. He should pay their salaries or living expenses, so that the shop will not feel the need of paying them anything, or at the most, paying them only what they earn. I recall one young man undergoing a process of this kind who earned in one of his best weeks the sum of 34 cents, according to the piece-work rates in the room he was in. He learned a great deal, one of the things being the value of a dollar—or rather of 34 cents.

If he is successful, if he can pick the right men to develop, and if he is wise enough to know when to stop leading them and to let them go on their own responsibility, the adventurer should make a large profit, and he will make it without taking anything away from anyone. There must be vast unexplored opportunities in this work, but they can only be found by men who have clear vision and who are not easily discouraged by setbacks. Also, there will be a temperamental lot of young men with whom to deal; they will be sensitive and high strung in many instances, and they would not be worth anything if they were not. Many times the promoter will find that the shops in which he places his proteges will turn them out in disgust; and yet, if he sticks to it, he may easily have the same shops begging for his men when they have developed into the finished product.

Is it not an inviting field for exploration?



The Evolution of the Workshop—XI

By H. H. MANCHESTER

Metal-working industries in America sprang up and developed rapidly in the period from 1810 to 1840. Important inventions were numerous, the production of such things as firearms, nails, and engines received a great amount of attention. This article gives a survey of the metal-working plants existing throughout the States during this period.

(Part X appeared in our July 8 issue.)

IN THE United States the period from 1810 to 1840 was in general one in which the factories were struggling for a footing against importations from England, and was marked by three serious financial crises. On the other hand, in the South the cotton gin had given a tremendous stimulus to cotton raising, while in the West the introduction of the steamboat was leading to the rapid settlement of the lands adjacent to the rivers. In short, throughout the whole era, development of farms was more important than that of mills or factories.

The workshops, however, at least kept pace with the demands. The engine for the Clermont had been ordered by Fulton from Watt and Bolton at Birmingham, to be made in accordance with his specifications; but the engines for Livingston's and Fulton's subsequent boats were built by them in America. In 1811 the first steamboat for the Western rivers was constructed entirely at Pittsburg, with the aid of Stowdinger, the engineer in chief of the North River boats. At that date there had been five steamboats bui't successfully to run on the Hudson, one for the Delaware, one for Lake Champlain, one for the St. Lawrence, and this one, the "New Orleans," for the Mississippi. In England, in this same year, there was only one steamboat running, the "Comet," which was in operation on the Clyde. Two years later there were two factories for steamboats located at Pittsburg, near which iron and steel for the engines were already produced. By 1818 thirty steamboats had been constructed on Western waters. An important advance in principles was made in the development of machine tools for the more accurate construction of interchangeable parts, especially for firearms. This idea, which seems to have been practically applied first by Eli Whitney, was also put into practice by Colonel North at Middletown, Conn., before 1814. In 1817, for example, he was using milling machines with cutters of irregular form for milling the pan and between the bolsters in the flintlock musket. This same year we hear of Asa Waters of Millbury, Mass., welding barrels under trip hammers by water power, and of a nut boring machine put into use by James Green at Harper's Ferry.

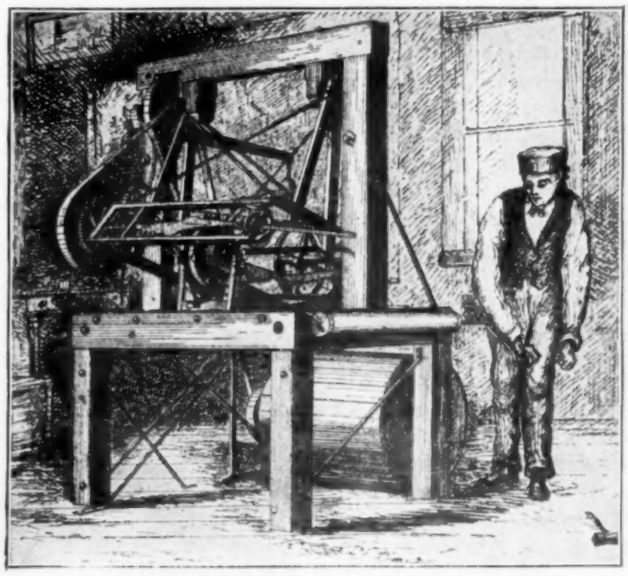


FIG. 66. BLANCHARD'S GUN-STOCK MACHINE

In 1818 Asa Waters took out a patent for turning gun barrels in a lathe, and it proved at once an improvement over the previous method of grinding them. It was while working this lathe that Thomas Blanchard conceived his idea for a machine, shown in Fig. 66, to

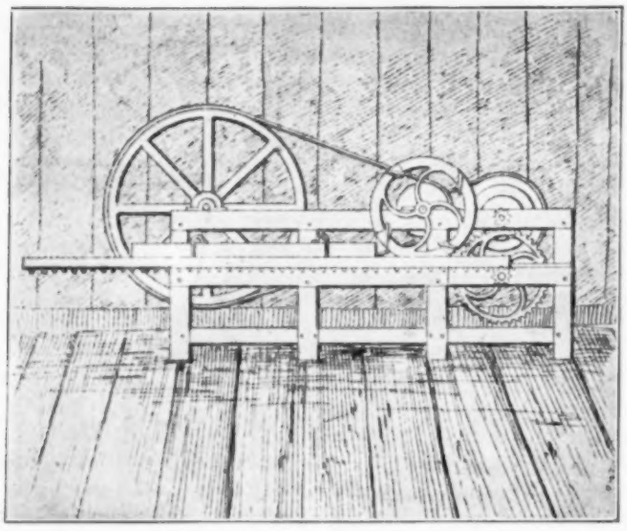


FIG. 67. A ROTARY-DISK PLANING MACHINE OF 1826

form the stocks of guns, which was patented in 1819, and soon afterward developed into his famous lathe for turning irregular forms. Blanchard was kept employed at the Harper's Ferry and Springfield gun factories, and received nine cents a musket for the use of his machine. He was also the inventor of thirteen other machines.

In 1819 J. H. Hall at Harper's Ferry made one hundred rifles which, according to a report of 1827, were entirely interchangeable. In 1830 cutters of irregular form were being employed for milling pistol locks. In 1834 Thomas Warner had a plain milling machine at work making lock plates, and others were employed at Middletown as well as at the Springfield armory where Warner was. In 1840 Warner built five such milling machines and was attaining interchangeable parts by combining milling and jig-filing.

The chronology of the period gives a fairly good conception of the progress being made in the workshops. In 1811 we hear of a machine for cuting off the ends of bolts invented by John Rewey, and a file cutter by Ernst Gehbe. In 1812 Morris B. Belknap also patented a machine for cutting files and sickles, and William T. James took out a patent for one which was in use at Union Village, while an improvement in wire drawing was made by William Wadsworth. In 1813 Jacob Perkins of Newburyport, Mass., who was already the originator of a number of inventions in our field, received a patent for making the shanks of screws, while Abel Stowell of Worcester patented two machines for making and finishing the heads of screws. It may also be of interest to note that Thomas Blanchard, who later invented the lathe for irregular forms, took out a patent for a horizontal sewing machine. In 1814 Moses L. Morse constructed a machine for manufacturing pins at one operation, but it is stated to have been too delicate to be a permanent success.

Activities After the War

After the close of the War of 1812, Secretary of the Treasury Dallas, as a basis for a new tariff, in 1816 classified the industries of the country in accordance with their ability to supply the home market. In the first class, as capable of filling the country's needs, he included the manufactures of iron castings, fire and side arms, cannon, muskets, pistols, and all sorts of carriages.

The second class, in which were placed those manufactures that were not then capable of filling the demand but might become so, included metal buttons, plated wares, iron manufactures of the larger kinds, shovels, spades, axes, hoes, scythes, etc., and nails, large and small. The third class, which was still mostly imported, embraced cutlery, needles, and iron mongery, except the larger articles.

In 1816 Jesse Reed of Hanover, Mass., the son of Ezekiel Reed, took out a patent for making tacks by machinery at one operation. Six of these machines were soon in use at Pembroke, one of them with one man running it producing 60,000 tacks a day. The next year Thomas Blanchard took out a patent for a machine to make tacks that had been first invented by him in 1806 at the age of eighteen. It was said to produce 500 tacks a minute, and was sold by Blanchard for $5,000. In the following year we hear of a patent for cutting metal combs, produced by Daniel Pettibone of Philadelphia, one for rolling metal tubes by Cyrus Eastman of Hillsborough, and lathes for turning gun barrels by both Sylvester Nash of the Harper's Ferry arsenal, and Asa Waters of Millbury, Mass.

Beyond comparison the most definite and dependable picture of manufacturing a hundred years ago is obtainable from the detailed accounts of the manufacturing establishments in the country reported for the census of 1820. The marshals in 1810, in their reports of manufactures, had included those made at home as well as in factories, but in 1820 the investigation was confined to mills and factories. On the face of the returns there seems to have been a falling off in production, but this is undoubtedly due to the omission of home manufactures, which is in itself an indication that the increasing importance of the factories was being recognized.

In the great majority of cases, however, the factories claimed that business had dropped off greatly since the close of the war or at least since 1818.

Distribution of Industry Throughout the States

How small the development of the factory system still was may be judged by the fact that in all Maine there was reported only one plant which made its products from iron or other metals. New Hampshire reported only three metal-working factories, two nail mills and one scythe factory. In Massachusetts, ma-

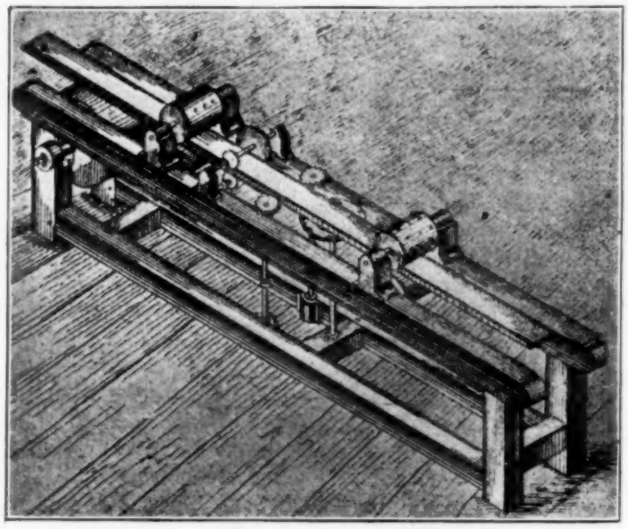


FIG. 68. A PLANING AND NOTCHING MACHINE OF 1834

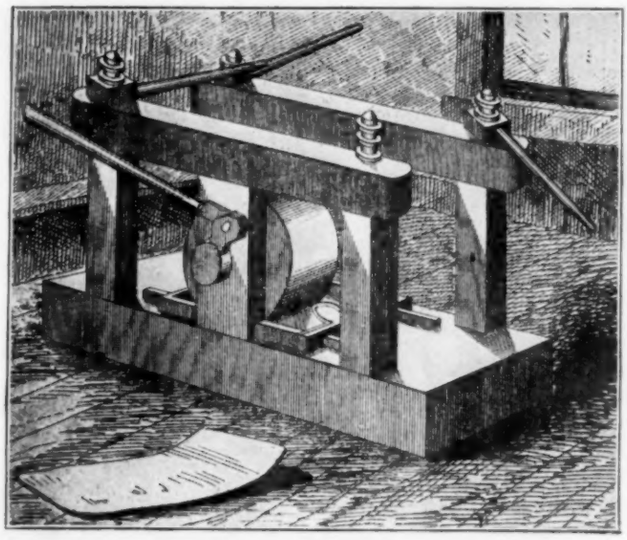


FIG. 69. A MACHINE FOR MAKING HORSESHOES

chine shops handling iron or other metals were listed in six counties, the nail mills, which also made rods, hoops, and brads, being the most important. The scale of wages was very low, as may be judged by the fact that in Plymouth County 72 employees in the nail mills received only $22,800 a year.

All Rhode Island reported only one metal-working machine shop, a nail mill that used machines for slitting, cutting, and heading. Connecticut reported at least twenty-eight machine shops working metals. These included eight producing bar iron, which were perhaps primarily foundries but made also plow shares, molds, and anchors. There were six manufacturing brass clocks, three forging anchors, three making firearms, three nail mills, two producing augers and screws, and one each making steam engines, stoves, and swords. A musket plant at New Haven gave its product as being worth $26,000 a year, and its consumption of iron as 30 tons. It had 53 employees, paid out $15,000 yearly in wages, and made use of machinery run by water and invented by its owner.

Vermont sent in accounts of only three factories in our field, all in Rutland County. The amazing contrast between a century ago and the present is emphasized by the scarcity of metal-working machine shops in New York City, only twelve being reported. There were no metal machine shops in Kings County, and only one in Queens. In all the rest of the State of New York there were only 65 enumerations. In New Jersey seven counties reported one or more mills for making bar iron, but besides these there were only one nail mill, a copper foundry and a stove factory in our field. Outside of Philadelphia, in the so-called Eastern District of Pennsylvania, seven counties listed plants making bar iron with about 35 forges, and there seem to have been seven plants making pig and castings and two rolling mills. In the Western District of the State factories of iron products seem to have been more prosperous than in the Eastern District. This was probably because the mountains protected them from importations from England, and the steamboat was increasing the possibilities of the Ohio and Mississippi valleys. In Allegheny County the plants making bar, boiler, and nail iron consumed 1,500 tons of pig worth, with other materials, $60,000, had a capital of $80,000, and were the biggest producers of the western district of the State.

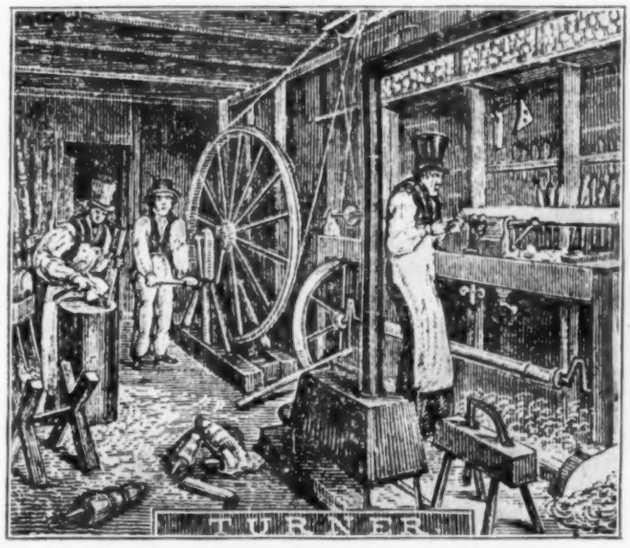


FIG. 71. A TYPICAL TURNING SHOP OF 1840

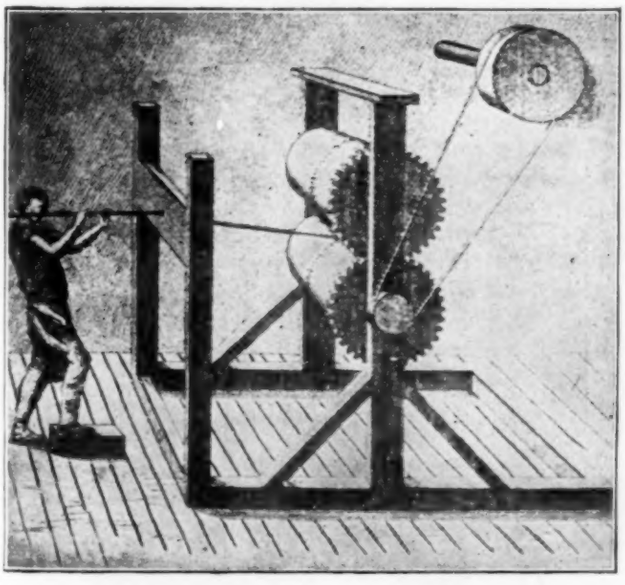


FIG. 70. A WIRE-NAIL MACHINE OF 1834

The only metal factories reported by Delaware used rolled and slit iron, bar iron, and pig. Baltimore had two mills making bar iron, sheet iron and nails, one of which produced boiler plate. Outside of Baltimore, there was a cannon factory in Cecil County which had a boring machine, and two factories there which had slitting and nail mills.

The marshals in the South, in the absence of factories, reported shops where the work was still done entirely by hand. Virginia had a number of foundries of pig iron and bar iron mills, but the only machine tools reported were in nail factories in Richmond and in Monongalia County.

In North Carolina there were three nail mills in Burke County and a shovel factory in Rutherford County. In South Carolina there was a musket factory at Greenville that had a production worth $30,000. Georgia reported one boring machine, and Alabama a shop with mill cranks, but these seem to have been the only machine tools in the two states.

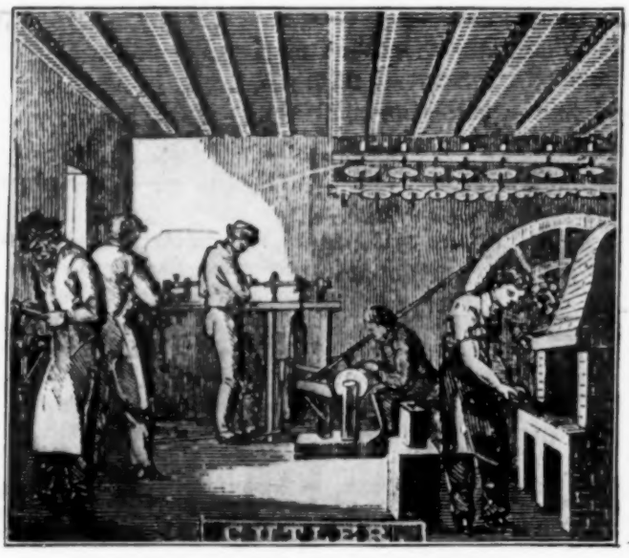


FIG. 72. A CUTLERY SHOP OF 1840

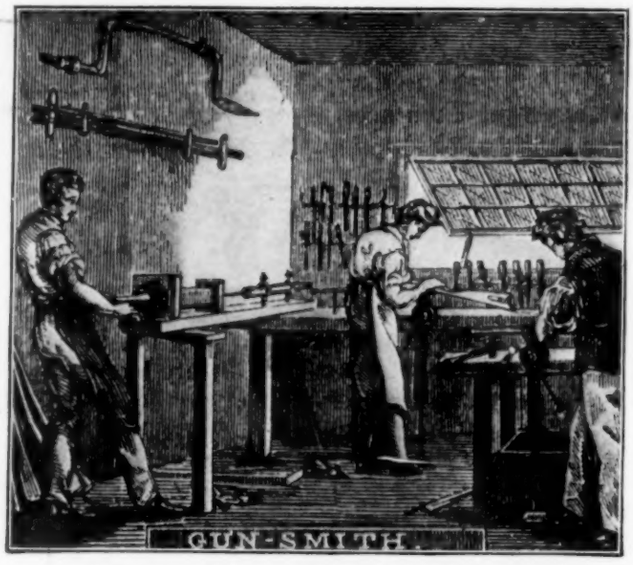


FIG. 73. A PRIVATE GUNSMITH SHOP OF 1840

In the new states west of the mountains, and especially in the Ohio valley, machinery seems to have been more general. In Cincinnati steam and fire engines were made to the value of $130,000 a year. Cincinnati also had three lathes run by horsepower and two nail machines driven by oxen. In the rest of Ohio the most common metal-working machinery was the nail mill, of which there were nine.

The only genuine machine shop in Kentucky seems to have been at Louisville. Tennessee reported about twenty mills making bar iron and five foundries of cast iron. There were listed also one rolling mill, two nail factories, and four boring machines for guns. There were no metal-working machine tools reported in Indiana, Illinois, Missouri, or Louisiana.

The annals of the period between 1820 and 1840 show that American inventive genius was paying more attention to other subjects than to metal working, but they contain various items of interest. In 1822 N. Wright of Onondaga patented several coopering machines. In 1827 John McClintic constructed what was called the first practical mortising and tenoning machine, and the next year William Woodworth took out a patent for his machinery for planing, tonguing, and grooving. While these machines were for wood working, they had considerable influence in the machine shop. Figs. 67 and 68 show two wood-working machines which represent the best practice of the times.

In 1830 the first locomotive built in the United States, the "Phoenix," was constructed at the West Point Foundry, and the development of the railroad which followed lent tremendous importance to metal working machinery a decade or two later.

A machine for shaping horseshoes was patented in 1828 and is shown in Fig. 69. In 1831 cast steel was not as yet considered a success in America, and cutlery made here was exhibited at the Franklin Institute for the first time. The next year coke was first successfully used in the manufacture of iron in the United States. J. J. Howe's valuable pin-making machine was patented the same year. Fig. 70 shows a wire-nail machine of 1834.

What was probably the first factory in America for making machinists' tools exclusively, was established in 1837 by John H. Gage at Nashua, New Hampshire.

Figs. 71, 72, and 73 give a good idea of how most work was turned out at this time, the small shop still being greatly in the ascendancy.

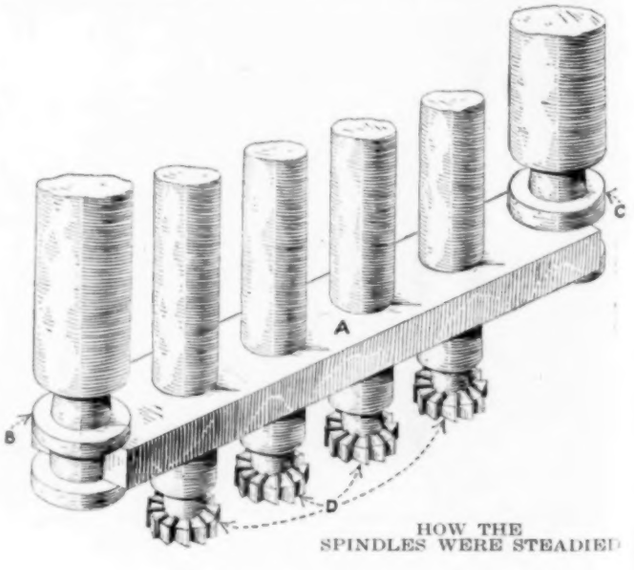
Steadying Drill Spindles

BY FRANK C. HUDSON

A rather novel method of supporting four drilling-machine spindles so as to use them for milling is illustrated herewith. This is a multiple-spindle drill with spindles all in a row and close together. They were spaced to make them right for the work in hand, milling the compression space in cylinder heads, by means of the flat steel bar *A*. This was bored with four holes correctly spaced and of such size as to afford a good running fit for the spindles.

The ends of the plate *A* were bored to a half circle to fit the special heads *B* and *C*. These heads have taper shanks which fit the spindles and the collars support the ends of the plate at both top and bottom.

As all spindles feed up and down together, the plate *A* always supports the four milling spindles at the same point above the cutters *D* and substantially prevents springing which would otherwise occur.



HOW THE SPINDLES WERE STEADIED

Testing the Accuracy of Micrometers in Common Use

BY C. A. HUBBELL
President of the T. R. Almond Mfg. Co., Ashburnham, Mass.

The data gathered by the author of this article and his assistants call attention to the fact that many employers and workmen consider a micrometer to be "always right," regardless of its use or abuse. Too much is generally taken for granted in regard to precision tools.

ALL of the data herewith presented have been compiled from the inspection of a great many micrometers of all makes in many different factories in different cities. Each instrument was checked for correct reading each tenth of an inch making eleven points from zero to one inch inclusive. The well-known Johansson master gage blocks were used as standards and the compiling of the data in the form of curves and plots was continued until there ceased to be any change in general shape, indicating that sufficient information had been collected to determine definitely the general, or average conditions throughout the country.

It is interesting to note that this checking caused to be discarded as unusable approximately 3 per cent of all the micrometers inspected.

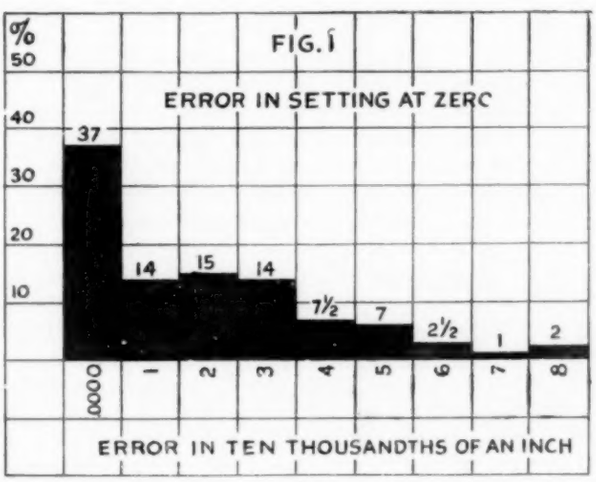
A most interesting and rather unexpected condition appeared in the large number of micrometers inaccurately set at zero. This error was almost universally minus and probably due to wear of the anvil and the end of the screw and is an indication of the care which the average mechanic gives to his tools, only thirty-seven per cent reading correctly at zero. A further interesting light was thrown on this subject when of the micrometers tested those owned by the employer were compared with those belonging to the employee. Fifty-two per cent of the employees' instruments were correct at zero; forty-eight were incorrect, while only 20 per cent of the employers were correct; 80 per cent were incorrectly set at zero. This seems to demonstrate pretty conclusively that it is quite universally nobody's business to look after the "firm's" tools, and emphasizes the importance and necessity of a periodical inspection of all gages.

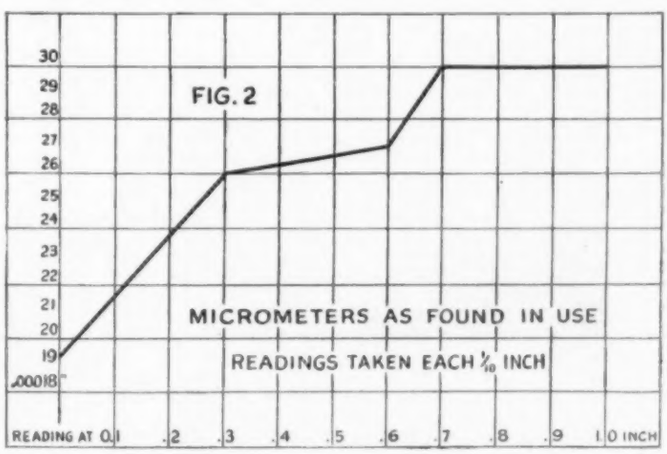
The average error in zero setting is about one-quarter of one-thousandth. It is not, however, the average error which causes troubles, but rather the error beyond some certain amount. The plot, Fig. 1, shows details of the errors at zero. Thirty-seven per cent of all micrometers are correct at zero. Fourteen per cent have an error of .0001 at that point; 15 per cent have an error of .0002, etc. Twelve and one-half per cent have an error at zero of one-half thousandth, or more.

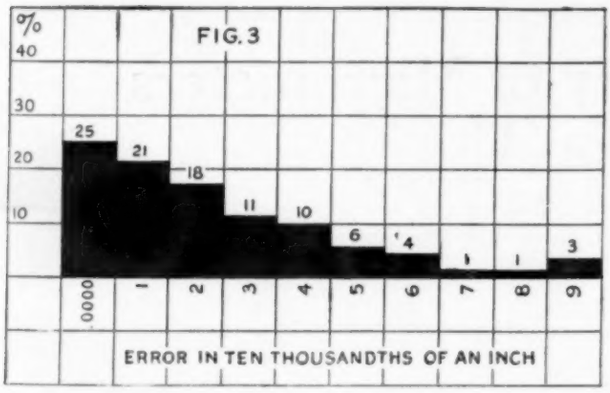
The errors at the ten other points checked (i.e. $\frac{1}{10}$-$\frac{2}{10}$-$\frac{3}{10}$ in., etc.) are shown as an average, in the curve, Fig. 2, and are due, in excess of the error in setting at zero, to inaccuracy of the micrometer screw. The curve was plotted by averaging the reading of all micrometers at zero (which is practically 0.0002 in.), all at 0.100 in. (which is practically 0.00022 in.), all at 0.200 in. (which is 0.00024 in.), etc. From 0.700 in. on, the average error is three-tenths of a thousandth.

The plot, Fig. 3, is made from the same data as the curve, Fig. 2, but shows the frequency of deviation, or different amounts of error. This plot shows all the readings of all the micrometers. For instance, suppose there were one hundred micrometers checked at the eleven points 0, .1, .2, etc. to 1 in., inclusive, then there would be eleven hundred readings in all. As shown in Fig. 3, 25 per cent of all these readings showed no error at all, or were correct; 21 per cent showed an error of one-tenth of one-thousandth (0.0001 in.); 18 per cent showed an error of two-tenths (0.0002 in.), etc., etc. Fifteen per cent showed an error of one-half thousandth, or more.

The plots and curves so far shown are all from data exactly as found in commercial use. The condition of the micrometers is due to the joint effect of the original condition of the instrument and the care or lack of care







of the owner and user. An effort was made to compare the different makes of micrometers and to do this fairly the very prevalent error of the zero setting of course, had to be eliminated. This correction also made it posible to compare new micrometers with those in use for some time.

In making this latter comparison no average difference is apparent, the instruments in use giving the same curve as new ones when those which show abuse are eliminated. There seems to be no question but that an instrument with reasonable care shows no wear in the screw and with proper attention to adjusting for wear of the measuring surfaces (anvil and end of screw), maintains its original accuracy.

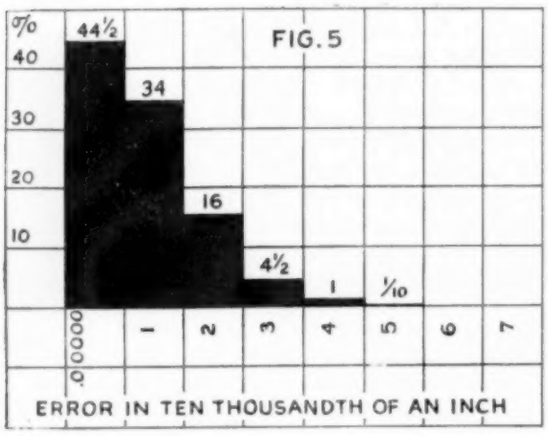
Fig. 4 shows the curves of the average measurements at each tenth of an inch, of micrometers made by four different manufacturers. All readings are corrected to eliminate any error at zero. It is evident there is no striking difference. The one showing greatest average error is one and a quarter tenths. They all indicate an accumulative error increasing from nothing at zero and rising to a maximum at or near one inch.

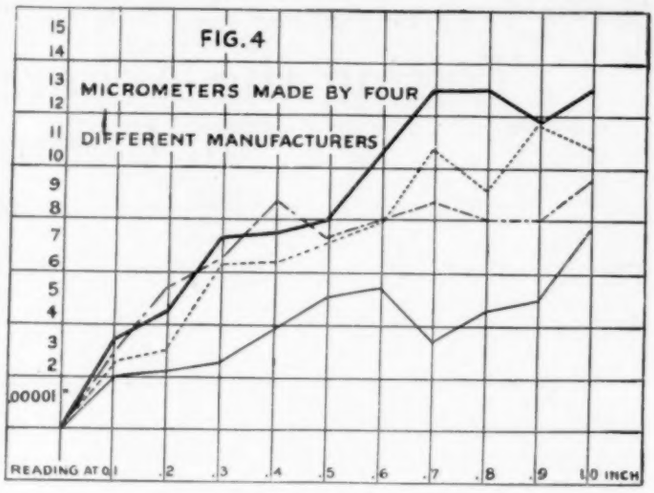
Average Measurements

The plot, Fig. 5, is from the same data as above and shows the frequency of deviation the same as Fig. 3, but after correction to eliminate error at zero, and hence shows the accuracy of the pitch of the screw the same as the curves in Fig. 4. Forty-four and one-half per cent of all the readings are without error. Thirty-four per cent have an error of one ten-thousandth of an inch, etc.

In Fig. 6 the average reading of all the micrometers in three different factories in the same city are plotted.

The two lower curves are machine shops. The higher one was a factory using two hundred





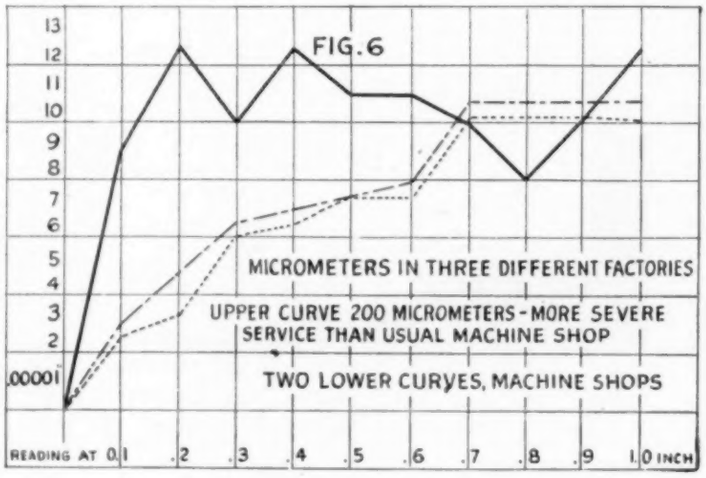
micrometers and under conditions somewhat more severe than the usual machine-shop service.

The curves of averages all show, as noted before, a tendency to accumulative error, but it is seldom seen however in individual micrometers.

Standardization Work in Europe

Mr. P. G. Agnew, secretary, American Engineering Standards Committee (A. E. S. C.) has rendered a report upon his recent visit to Europe, where he attended a meeting in Brussels of the International Electrotechnical Commission. He states in his report that during the trip he was able to call personally upon the secretaries of the national standardization bodies of England, Holland, Belgium and France and that the desire was expressed by each society for co-operation with America in all cases where it should be found feasible to obtain international agreement. The report tells of the organization and the work of the different engineering societies, the salient points being covered in the following paragraphs:

The British Engineering Standards Association was organized in 1901 as the Standards Committee by five leading technical societies, and was incorporated in 1918. The executive authority is vested in the main committee of 24 members, 19 of whom are appointed by the five engineering societies mentioned, and the remaining five by the appointed members. Sectional committees have charge of the technical work in different



subjects, with sub-committees under them. Under the sub-committees are panel committees, there being some 275 committees with a membership of 1,370. The chairmen of sectional committees are named by the main committee, but the members are designated by organizations directly concerned in the work undertaken. The members may designate men such as consulting engineers to complete the committee. The income of the association is derived from many sources, the government, municipalities, railways, industrial associations and private firms all contributing. The work performed covers a very broad field. The publications of standards or specifications are revised when necessary, and they are also translated into foreign languages.

In France the "Commission Permanente de Standardization" is an official organization and is supported entirely by the government funds, which is true of no other standardization society. It was established in 1918. The commission itself has twenty-four members, nine representing various government departments, one the Academy of Sciences, and the remainder national engineering and industrial bodies. The members are appointed by the Minister of Commerce, after being nominated by the organization which they represent. The actual technical work is in charge of fourteen sub-committees, each working upon a different subject. The French National Committee of the International Electrotechnical Commission functions as the electrical committee. Tentative specifications, as drawn up by the sub-committees with the co-operation of the government departments, are submitted to the various interested bodies and to the technical press for criticism before the specifications are definitely decided upon and approved by the commission. Already a large list of specifications and standards have been officially adopted.

In Belgium the "Association Belge de Standardisation" was organized in 1919, chiefly by the "Comité Central Industriel de Belgium," which is a strong organization representing eighty associations and playing an important part in the reconstruction of Belgian industry. The main committee of the association comprises thirty-seven members, four representing the "Comité Central," thirteen representing the national engineering societies and twenty representing various industrial associations. The main committee appoints working committees, usually ten to fifteen men on each and composed of representatives of the organizations interested in the particular subjects being investigated. Owing to the industrial position of Belgium and its commercial relations to other countries, the association is making extensive use of the standardization work of other nations and is modifying it to suit the needs of Belgium. A series of standard bolts and rivets has been worked out, among other things, and work on mechanical power transmission, steel sections and reinforced concrete is now being carried on. The income of the association is derived from the organizations represented and from subscriptions received from firms and individuals.

In the Netherlands unification work is cared for by the "Main Committee for Standardization in the Netherlands," which was organized in 1916. It consists of fifteen members, two being furnished by both the Society for the Encouragement of Industry and the Royal Institute of Engineers, and the others being designated by the committee itself. As in the case of Belgium the standardization work is much affected by that of the surrounding countries. The standing committees, there being seven at present, are chosen by the main committee, and sub-committees handle the more detailed part of the work. The central office does a larger part of the technical work of standardization than is the case with the other national standardizing bodies, even making tentative proposals for the consideration of the committees. As in the United States, the main committee is not responsible for technical details but is responsible for procedure. Standards tentatively approved by the standing committees are given a great deal of publicity before being officially approved. The government supplies $6,000 of the income of the organization, which is $16,000.

In Italy the national engineering society is at present forming an engineering standards organization.

There is a movement at present in some of the countries to promote co-operation between the associations and the government departments. The idea is generally accepted that many advantages might accrue from co-operation between the committees of different countries. The idea of an international organization patterned after the national ones has received some attention, but nothing will probably be done in this line for some time.

Saving Pattern Work by Using Stock Cores

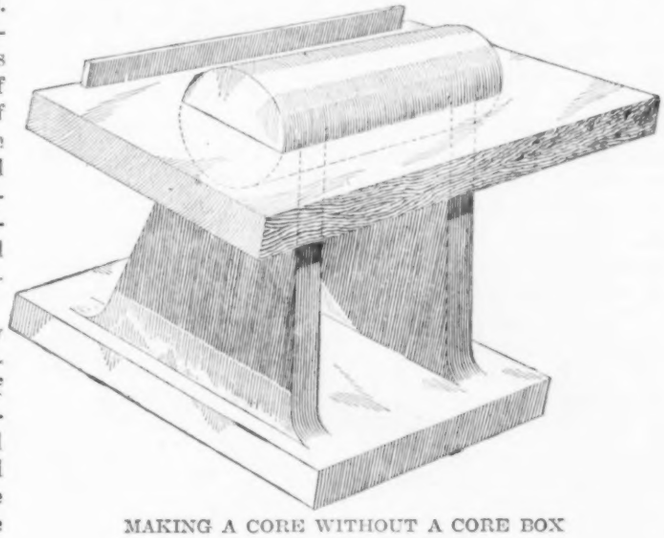
By William C. Nelson

On page 355, vol. 52, of *American Machinist* M. E. Duggan advocates the saving of pattern work by using stock cores.

Referring to his illustrations, core "*D*" is shaped over the journal bearing. To dig out or scrape a core like this would require much time and patience and would lead to some very strong language from the molder to whom the job might be given.

A far easier way to produce this core without the aid of a corebox would be thus: Have the flaskmaker saw out a board in the shape as shown in the illustration herewith. Place this board over a pattern, and, with the aid of a straightedge, ram up a core. Send board and core to the oven to bake and proceed further as Mr. Duggan suggested.

In good foundry practice, it does not always pay to attempt to save patternmaking.



MAKING A CORE WITHOUT A CORE BOX

A Jump Test for Motor Trucks

THE purpose of these tests, held on Nov. 25, 1919, was to subject various models of trucks to shocks far in excess of anything likely to be encountered in actual service, in order to study the effect of different spring and tire equipment on impact, and the effect of unsprung weight upon road impact, as well as the effect of varying speed on those impacts. In other words, to study the "grief" on both road bed and truck chassis and how it is modified by varying factors for unsprung weight, tire equipment, and speed.

A test along the same line had already been attempted by the Bureau of Public Roads in conjunction with the Bureau of Standards, where road impact was studied by having trucks drop over a low platform onto another platform. This test was not satisfactory, for it took into consideration only one factor, viz., road impact, and left out any study of the stresses set up in the truck, as well as the effect of rebound, etc. Also, the distance dropped was very moderate.

THE INTERNATIONAL MOTOR COMPANY'S TEST

To overcome these shortcomings and to study these neglected factors, as well as to investigate a large number of empirical and theoretical assumptions on these and kindred subjects, a series of "jumping tests" was conducted on Nov. 25, 1919, at 79th St. and North River, New York, using for the first time a new system of motion pictures to record accurately the results obtained.

Trucks were run at speeds of from 15 to 18 miles per hour along a straight-away and over a sharp incline. They naturally sprang into the air and struck the ground as from a vertical drop of several feet. A stretch of level ground was used as an approach, and the trucks gathered headway over this for the jumps under their own power. The speed of each truck was determined by taking the time required for the last 100 ft. of its run. The take-off platform, built of heavy lumber, was 6 ft. long and raised 1½ ft. at the far end. It can be seen in Fig. 1.

Five different Mack trucks were used in this test, consisting of one 2-tonner, having pneumatic front tires and solid rears, a 2½-tonner of the same type having pneumatics all around, a 3-ton truck, a 5-ton truck, and a 5½-tonner, all on solid tires. These trucks were numbered respectively E-8, E-17, E-15, E-18 and E-22, all of which are shown in Fig. 2.

*From a paper read by A. F. Masury, chief engineer of the International Motor Co., on April 8, before the Metropolitan Section of the Society of Automotive Engineers.

The trucks themselves were painted in the following manner for the purpose of aiding observation. The tire rims, one spoke on each wheel, and the hub caps were painted white. The white rim enabled tire deflections to be measured and the white spoke showed the revolutions of the wheels. A strip of sheet metal marked off in 3-in. bands of black and white extended down past the hub caps from the lips of the fenders and served to show the rise and fall of the hub.

RECORDING THE DATA

The horizontal distance which each truck jumped was measured by a curbing along the back of the runway marked off in feet, see Fig. 1. A large blackboard, marked off in 1-ft. squares behind the curbing, showed the height of the jumps. Since the moving pictures show the trucks against these scales, the positions of different portions of the trucks at any instant can be accurately determined.

An Eastman Kodak timer showing seconds was placed where it would be photographed on the film. A hand sewing machine with a white card on the plunger was set on a table back of the incline. For each revolution of the crank the plunger rose and fell three times, and a man with a stop watch turned the crank three times per second, thus measuring eighteenth parts of a second. A phonograph motor and turntable, not shown in the figures, was placed on the stone buttress at the near side of the incline. On the turntable was mounted a cylinder marked off in four equal sections. The first being solid black, the second white on top and black on the bottom, the third solid white, and the other black at the top and white at the bottom. The governor was to give a speed of 60 r.p.m., so that the pattern on the cylinder showed quarter-seconds.

FIG. 1. GENERAL VIEW OF THE APPARATUS USED

THE PICTURES

The pictures taken were both of the ordinary type with sixteen exposures per second, and those known as novograph pictures in which 160 exposures are made per second. Fig. 3 shows the camera equipment. When the film obtained with the novograph camera is projected at the standard rate it shows a moving picture in which the speed of motion is only one-tenth that of the subject, thus giving almost ideal conditions for the accurate and careful study of the subject in motion. Fig. 4 shows one of the big trucks leaving the incline and Fig. 5 shows one of the smaller trucks striking

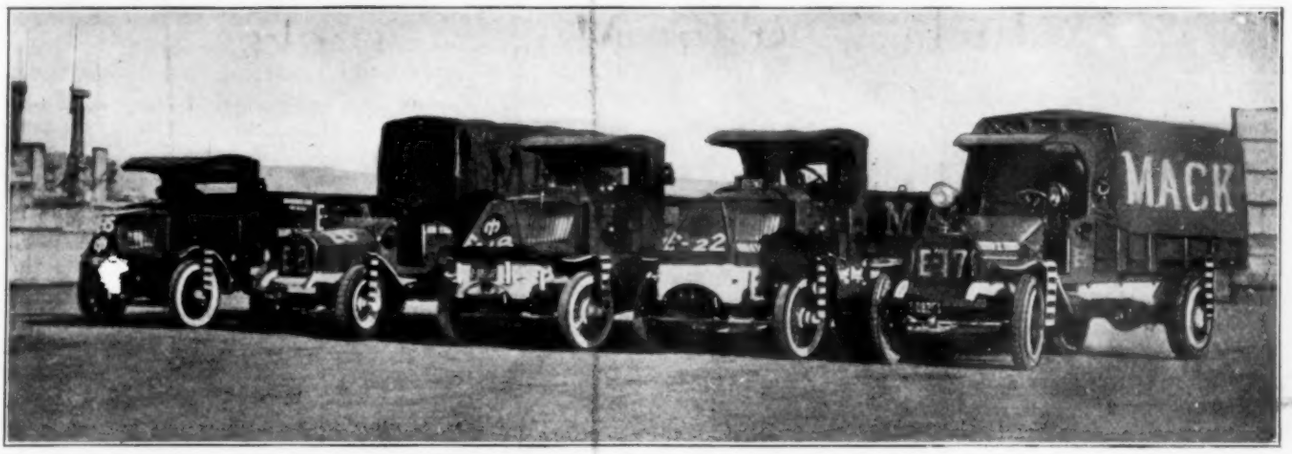


FIG. 2. TRUCKS USED IN THE TEST

the ground, an idea of the severity of the test on a loaded truck being given.

The films were studied both running and still, accurate measurements and calculations made and conclusions definitely arrived at. By the use of an incandescent projector the films could be stopped at any desired point for special analysis. In this way the time in the air of each axle, the time and amount of deflection of each spring and tire, as well as distance moved vertically and horizontally of each of the parts, were accurately recorded, both on the original jump and on the rebound.

Data and Results

Tables giving the data and results of the tests were prepared. The weight, both sprung and unsprung, of the front and the rear, the tire equipment, the speed of the machine, and the distance of the jump were determined for each truck, besides the spring and tire deflection as measured from the pictures. The forces of the blows struck by the falling trucks were calculated from the formula which follows.

The energy exerted by a falling body is equal to the energy required to raise it to the height from which it fell. If the vertical velocity and weight are known the energy equals the weight times the vertical velocity squared, divided by twice the acceleration due to gravity, or:

$$E = \frac{WV^2}{2G},$$

where W = Weight in lbs.

and V = Vertical velocity in feet per second.

In the case of a motor truck driven over an upward inclined plane the vertical velocity can be obtained from the speed of the truck and the angle of the incline, or:

$$V = \frac{S \times 88T}{60} = \frac{22ST}{15}$$

where S = Speed in miles per hour

and T = Tangent of angle of incline.

The average force of a blow equals the energy

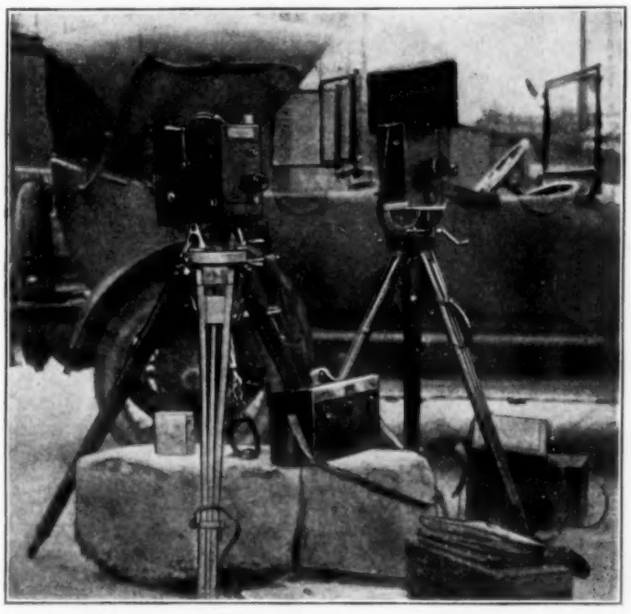


FIG. 3. THE CAMERA EQUIPMENT

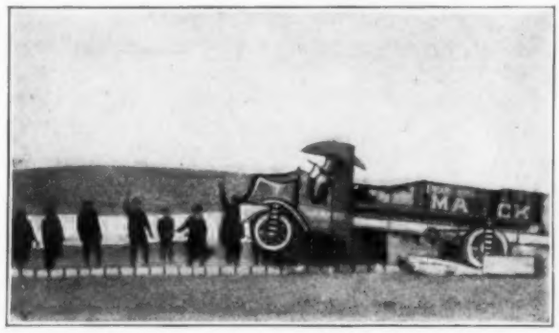


FIG. 4. A TRUCK LEAVING THE PLATFORM

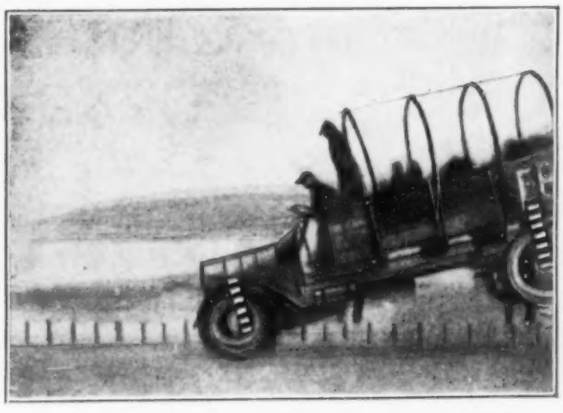


FIG. 5. A TRUCK STRIKING THE GROUND

of the moving body in ft. lbs., divided by the distance in feet required to stop it, plus the weight of the body, or:

$$F = \frac{E}{D} + W, \quad \text{where } D = \text{Distance to stop in feet.}$$

Combining these three formulas we have:

$$F = \frac{W\left(\frac{22\,ST}{15}\right)^2}{64.32\,D} + W$$

This formula can be applied to the unsprung weight of a motor truck by taking the deflection in the tires and ground, and to the sprung weight by taking the spring and tire deflection. These forces should not be added together, for they do not occur at the same instant.

Conclusions

The conclusions drawn from this test are that the impact of a truck striking the ground after bounding over an obstruction is approximately proportional to the weight and to the square of the speed, and inversely proportional to the resiliency of the springs and tires and to the ratio between sprung and unsprung weight. By this is meant that, while at given speed twice the weight will strike the ground with twice the force from a given height, if the same weight strikes the ground at twice the speed, it will strike the ground four times as hard; but that springs or tires twice as resilient will halve it, although with great unsprung weight the effect of the resilient springs will be lost.

In the test the pneumatics saved the road two-thirds of the grief, and the vehicle itself one-fourth. Following this thought to a logical conclusion it would seem obvious that, contrary to popular impression, the heaviest trucks might be less destructive to roads than the lighter ones. Not only would a 7½-ton truck on pneumatics do less damage to the road bed than a 5-tonner on solids operating at the same speed, but also, inasmuch as the heavier truck is a slower vehicle as a rule than the light one, another consideration enters in favor of the heavier truck. Since speed has been shown to have effect as its square, whereas weight does not, it is seen to be the principle determining factor.

Looking Backward

By H. B. Stillman

In comparing conditions of shop life to-day with those of twenty or thirty years ago, as I did in a previous article under the above title, I should have stated that my opinions were based upon my own experience and observations in factory work. I started shop work at fourteen, and now, at forty, am still at it; therefore I do not feel as if I could be justly accused of talking through my hat when I say that in my honest opinion the average wage-earner is to-day better off physically, morally, and mentally, than he was twenty or thirty years ago.

In the matter of factory lighting, for instance, how many of us with a quarter of a century or so of shop life back of us would care to swap the modern system of lighting—the bright electrically-illuminated shop of to-day for the old kerosene lamp in general use about the time of the Boer War and later? There may have been other means of furnishing artificial light at that time in towns unprovided with gas, but I was never lucky enough to have my name on the pay-roll of any shop but what depended upon these old smoky, smelly kerosene lamps.

I firmly believe that these lamps were the cause of more headaches, more eye strain, and more profanity than most other agencies. Any workman who is inclined to be "fussy" with his work, and especially the mechanic of the old school who takes pride in turning out a neat piece of work, will agree with me when I say that the modern system of factory lighting has reduced a lot of our worries and trials on that score.

Another feature I wish to mention is the various plans many manufacturing concerns have adopted to win the esteem and co-operation of employees, and to assist them in matters entirely outside of the days work. The plant where I am employed recently installed a library for the free use of all the hands, under the same rules and restrictions common to public libraries. A committee is appointed to select the books and these volumes include the latest and best in fiction as well as standard technical works for those who can appreciate instructive matter of this kind. I would like to ask if any of the "old timers" who pine for the good old days can recall many instances where good reading matter was furnished free to the help, or if they can recollect any circumstances where a set of standard text books were at their disposal without cost to them?

I wonder how many workmen appreciate the fair play policy adopted by most progressive manufacturing concerns at the present time? The policy which gives the worker who has had difficulty with his foreman a chance to tell his side of the story? In these days it is conceded that the foreman isn't always right, and usually there is an employment manager, welfare superintendent, or someone with the necessary ability and tact to investigate and smooth out matters of this kind, assuring the complainant of a square deal.

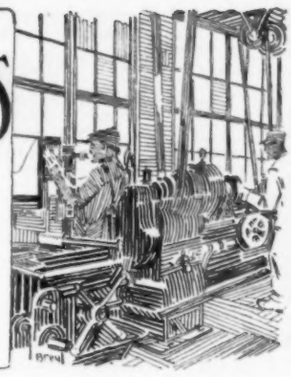
A case in point happened in a neighboring factory where a dispute arose between a workman and his foreman over some trifling affair about the work. One word led to another and the upshot of the matter was that the workman gave his notice to quit that night. The superintendent, a true advocate of the "live and let live" principle, called the workman into his office and asked him to explain. Upon hearing his claim that the foreman had been trying to rub it into him, the superintendent ordered him back to his bench with the promise that the matter would be immediately investigated.

The trouble was found to have originated several months before in a matter entirely foreign to the shop, and was settled very sensibly by transferring the worker to another department, where he is still on the job.

In the old days a large share of the hiring and firing rested upon the foreman, along with other responsibilities of which the average department head of to-day knows little. The foreman was on the job to get the work out, and it was up to him to say who should or who should not help him do it. Foreman had their likes and dislikes the same as the rest of us and as a rule they were not inclined to do any "pussy footing" as far as retaining help is concerned. Men were plenty and jobs were scarce, so why worry as far as a man or two was concerned.

MODERN PRODUCTION METHODS

By
W P. Basset
of
Miller, Franklin, Basset & Co



Controlling the Work in the Shop

Rigid planning, based on the theoretically possible production of men or machines and which makes no allowance for emergencies, always has failed and always will. That is why so few manufacturers attempt to plan the work of their shops more than a day or so ahead.

(Part VII was published in our issues of July 1 and 8.)

THE common idea, founded on the teachings of the early industrial engineers, is that a schedule of production, once drawn up, must be lived up to whether "school keeps" or not. That idea offends the common sense of most managers, for they know that workmen quit, machines break down and the actual production of both varies above and below their theoretical capacity. If an inelastic schedule exists, it can not stretch or contract to meet the actual accomplishment in the shop—it will therefore break and become useless at the first emergency. And the emergency which causes the breakage may be so slight a thing as that John Jones at milling machine No. 5 has had a bad night and today is turning out but eight parts an hour when the schedule says he shall turn out ten.

Whenever anything happens in the shop to slow down or interrupt any operation, obviously all succeeding operations will be affected. But what is that to the clerks in the planning office away from the sweat and noise of the shop? The schedule they have made allows for no delays—therefore there can be none.

The "Booth System"

Such planning is worse than useless. Better than that is the extreme opposite method of handling production from hand to mouth by means of stock chasers, who with all their faults are at least in touch with the shop and in sympathy with its trials and troubles.

Neither of these two methods is necessary. The good points of both can be attained. The central planning department can be given control of production from raw materials to finished stock, and yet its plans and schedules can be flexible and adjusted to the day-by-day happenings and breakdowns in the shop.

The method I am describing does just that—does it quickly and easily by means of what, for the sake of brevity, I shall call the "booth system."

I have said that the planning department must be given sufficient authority to enable it to carry out its plans. This authority must be exercised in such a way as not to interfere with the authority of the individual foremen. One of the chief objections to the stock chasing system has been the breaking down of discipline and morale due to the intermittent interference by stock chasers with the laying out of the work in the manufacturing departments. The booth system obviates this, yet gives the planning department control of the flow of work in a department, and assures flexibility to the planning.

Of necessity, the method of handling the work through the booths varies greatly with local conditions. The success of a highly developed production department depends largely on smooth running booths precisely adapted to the peculiar conditions of the plant.

No matter how many of the practically innumerable methods of handling production booths I were to describe, I could not cover the needs of all kinds of machine shops, for the details must be different to meet the conditions in the individual shop. So I shall describe the booth system as used in the plant of the Warner Gear Co., as throughout this series I have largely used that concern's method as a model. The conditions met in that plant, I believe, are fairly typical of those in the majority of machine shops.

Issuing Work to the Shop

Before getting to the booth, however, we must go back to the central planning department to see how work is issued to the shop in accordance with the plans as shown by the schedule control graph and other forms.

From the parts list, Fig. 15, the planning clerks make out for each lot of each part a requisition, Fig. 39, in duplicate; three copies of a service card, Fig. 40, for each operation; a move order, Fig. 41, for each time the lots move from the jurisdiction of one booth to another; an in-slip, Fig. 42, in duplicate; and a traveler form, Fig. 43. These forms are made out as shown, by the production department, in advance. Since one form for each lot in the series must be made out identically except for the lot number, some duplicating process will be found to cut what otherwise might be an onerous clerical cost. We have found the gelatine machine to be very satisfactory for this purpose. As many sets of the tickets may be made out in advance as time and general conditions warrant.

They are filed by part number in the production department in a file called "service cards to be given out." A handy way to file the forms is as follows: First the service cards for the first operation attached to the copies of the requisition. Service cards then follow in sequence of operation, the in-slips being attached to the service cards for the last operation. Move orders are attached by means of a clip to the service cards for the operation preceding the move.

WGCo. MD43 STOCK REQUISITION — Cost Department Copy — ACCOUNT NO.

ORDER NO	LOT	QUANTITY	PATTERN NO.	PART NO.
	10	50		D41-1

PART NAME: Transmission Case — PRICE — AMOUNT

DESCRIPTION: Mal Iron

CR. ○ OSKI ○ TO. ○ REPAIR ○ ASSOUR. ○ N. P. ☐

FROM STORE NO. — DELIVER TO: DEPT. C4 MACH. 202 — DATE

DELIVERED BY — RECEIVED BY — SIGNED

FIG. 39. STOCK REQUISITION (MADE OUT IN DUPLICATE, 1 PINK AND 1 GREEN)

The schedule control man, watching his schedule control charts, sees that part D-41-1 is due to start June 1, in department C-4. From the file he removes the requisition and all service cards pertaining to the progress of the proper number of lots of part D-41-1 through department C-4. These are sent to the booth man of department C-4.

The booth man is the point of contact between the central planning department and the shop. The number of men and machines which a booth man can handle depends largely upon the number of lots going through his department daily. Since each time a lot is completed on an operation it demands clerical work, it is apparent that the nature of the work in a shop will determine the size of a booth's department. About 225 time changes is the most a good booth man can handle. If for cost finding purposes the shop is departmentalized, it is often well to departmentalize the booths to correspond somewhat.

Construction of the Booths

The booths themselves are of light construction and occupy a floor area of about 6 x 9 ft. Exterior and interior views of a typical one are shown as Figs. 44 and 45. The front of the booth is sheathed to about 3 to 4 ft. from the ground where a counter is placed on the inside of the booth. Above this, wire screening is placed for a height of about 5 to 6 ft. An opening is provided in this netting through which the service cards may be handed to the men.

Mounted in the screening is a board which is pivoted at the top and bottom so that either side may be turned toward the shop. A strong clip is attached on each side. One side of the board is painted red and is known as the "truckers" side and the other black and called the "booth" side.

Hanging on the back wall of the booth is a production board, divided into sections, each section of which is divided into three compartments as shown in Fig. 46. Each section is labeled to correspond to one of the machine tools under the control of that booth. In the bottom compartment are kept the tickets for the job running on the machine; the middle pocket holds the tickets for the next job which is already at the machine, and the top pocket is for work that is in the department, but which has not as yet been moved up to the tool.

For timekeeping an electrical or mechanical device should be used. A rack is also provided to be used in connection with the time-keeping. The pockets in this rack are numbered to correspond with the man's number in the department. Aside from a few box files and the usual office supplies there is no other equipment in the booth.

When the job tickets, which are sent out from the central control, are received by the booth man, he files them by machine number, keeping them in the sequence in which they were received by him. These, of course, are placed back of any work which is already in the file. Travelers are filed by part number in a separate file of suitable size.

How the Booth Work is Handled

Now to get down to how the work of the booth is handled: Let us say that the booth man, looking at his board, sees that there are but two jobs ahead of machine No. 202, and that machine No. 202 performs the primary operation.

How does he insure that there will be work for the machine, so that no time will be wasted? He takes from the job file the service cards for machine No. 202, to which are attached two copies of the requisitions. He puts the service cards in a temporary file, arranged by machine-tool number. From the traveler file he takes the traveler which corresponds to the requisition, and sends it, together with the two copies of the requisition, to the stockroom called for on the requisition.

If the job which the booth man has ordered out for the machine is different from the one running there at present, he fills out four copies of a "set up instructions" form, Fig. 47, sends one copy to the tool crib as a notice for them to get the tools ready for the new job going into the machine; the second to the foreman as a notice that that job is to be set up; the third to the salvage department, and keeps the fourth copy himself. He gives on this order all of the necessary information as to part number, machine and operation for the new job, and also tells approximately when it should be ready to set up. This order should be given out at least an hour before the tools are required, to give the tool crib attendant time to determine whether all of the required tools are ready. If they are not, the booth man is to be notified immediately so that some other job may, if possible, be lined up for that operator.

The stock keeper places the traveler together with the required amount of material on a truck. The trucker then takes the lot and one copy of the requisition and leaves the lot at the machine called for on the requisition. He then puts the requisition on the booth man's side of the move board, and returns to his other work. The copy of the requisition which has been left in the stores is posted to whatever records may be kept by

Workman's No. — WGCo. MD40C SERVICE TICKET TIMEKEEPING AND PAYROLL DEPT.

Lot No.	Inspector's O.K.	No. of Pieces
10	Operation	Wanted 50
Part No. D41-1		Completed

Operation No.	Dept.	Mach. No.	Material	Tool No.	Time Clerk	Good
1	C4	202	Mal I	C806	Booth Man	Rejected

	Time	Date	Time Hrs.	Time 10ths	MOVE To Dept.	P. W. P. O.K.	Scrapped
	Finished				C4	Extension	Credit Workman
	Started				To Mach.	Posting	P. W. Price
	Elapsed				202		Charge Mach.
	Standard Time		7.0		Foreman's O.K.		Amt. Earned

FIG. 40. SERVICE TICKET (MADE OUT IN TRIPLICATE, 1 WHITE, 1 YELLOW AND 1 MANILA)

MOVE ORDER WGCo MD41

ORDER NO	LOT	QUANTITY	PART NO
	10	48	D41-1

MOVE FROM		DELIVER TO	
DEPT C4	MACH 76	DEPT C4	MACH 21
DEPT	MACH	DEPT	MACH

REMARKS

DATE SIGNED REC'D

FIG. 41. MOVE ORDER

IN SLIP WGCo.MD42
PRODUCTION DEPARTMENT COPY

Date _____ Order No. _____
Pattern _____ Part No. D41-1
Lot No. 10 Stock R.S. ○ Semi ⊘ F.S. ○ Repair ○ Assemb. ○ Scrap □

Quantity	Description	Price	Amount
46	MAL I TRANS CASES.		

Send to Dept. SEMI ST. Storekeeper _____ Inspector _____ Sect. _____ Bin _____

FIG. 42. IN SLIP (MADE OUT IN DUPLICATE, 1 BLUE AND 1 PINK)

the stores keeper, and is then sent to the cost department for its records.

The copy of the requisition which has been left by the trucker on the move board notifies the booth man that the work is at the machine and that he can release from his second file the service cards for that lot. These he places in the second pocket of the production board in the compartment for the machine that is to perform the first operation. The requisition is then returned to the planning department.

Following the Lot from Operation to Operation

We have next to consider the steps necessary to follow a lot as it goes from one operation to another.

Let us assume that the operator on machine No. 202 has completed a job and that his net job is the one which we have just requisitioned from the stores. When he finishes the job he is on he comes to the booth window and turns in his service card for the previous job. On the back of this service card has been noted the number of his next job. At the same time that he turns in his service card he also turns in the traveler which he has taken from the lot he is to operate next, as shown on the back of the service card he has just turned in.

PART NO. D41-1							LOT NO. 10	NO. PCS. 50	MATERIAL MAL IRON.
Op. No.	Dept. No.	Workman Day	Workman Night	Insp. No.	Rejected	Pieces Good	Operation Name		
1	C4						TURN FLANGE		
							FACE FLANGE		
3	C4						(THIS OP IS VERY TROUBLESOME)		
4	C4						DRILL OIL HOLES		
5	C4						DRILL BOLT HOLES		
6	C4						COUNTERSINK BOLT HOLES		
7	C4						GRIND FLANGE		
8	C4						FACE IDLER		
9	C4						DRILL IDLER HOLE		
10	C19						STOCK.		
							TRAVELER	WGCo. MD44	

FIG. 43. TRAVELER FORM

The "man's copy" and the "time-keeping copy" of the service card for the previous job are both rung out. At the same time the service cards for the next job on machine No. 202 are taken from the center pocket of the board, which you will remember holds "work ahead or at the machine." The man's copy is checked with the traveler to see that it corresponds as to part number and lot number, and, if it does, is rung in. This checking is done in order to safeguard against the workman being given a service card for the wrong lot. The time-keeping copy of the service card for the previous job is placed on the move board as a signal to take the completed work to the inspection department; or if no inspection is necessary, to the machine that is going to perform the next operation.

Filing Service Cards

The man's copy from the previous job is now placed in a file arranged by the man's number, of "men's tickets awaiting inspection report." The cost and production copy of the service card is placed in another file of service cards awaiting inspection report. This file is set up by machine numbers. The file of the man's copy of the service card awaiting inspection is set up by days, to give a check on the inspection department lest they do not inspect the work in the sequence in which it comes to them, and also to insure that the work does not lie around the inspection bench too long. This file is gone over every morning and jobs that have not cleared the inspection department are reported to the head inspector for action. When the lot has been inspected, the inspector returns the copy of the man's service card to the booth with his report as to pieces good, rejected, and scrap. He also enters upon the traveler the same date and also the number or numbers of the men that worked on the lot.

From the copy returned from the inspection department the booth man enters upon the man's copy and the cost and production copy the results of the inspection. If a job is not

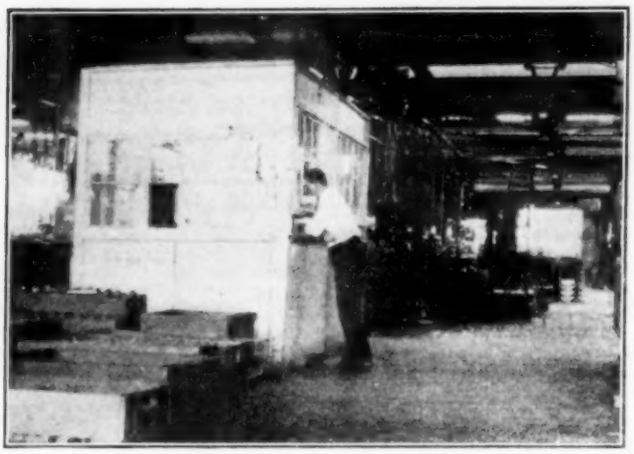


FIG. 44. EXTERIOR OF BOOTH

inspected on the day the work is performed, the man's copy goes to the payroll department and the man is paid for the number of pieces that are shown on the ticket. The man's copy is checked in the booth at the end of the day, before it is sent to the time-keeping department, to see that no time is missing when all such cards have been collected. If the inspection report is late and does not arrive until the following day, the time-keeping copies, with the inspection report entered on them, are sent in with the other service cards to the payroll department and are used as a charge back on the payroll, the payroll department sending back to the shop the corresponding man's service card which may be given to the man if desired.

There is a difference of opinion as to whether or not it is desirable to give to the men the copies of their service cards. Usually, the extra effort seems worth while, for the men like to know in advance what their pay for the week will be, and in these days it pays to coddle the men to that extent, surely.

Lots Requiring More Than One Day to Complete

If a man is unable to finish an operation on a lot by quitting time, it is obvious that some means must be provided to carry on the work the next day. We handle the situation in this way: For those jobs which are going to extend over, an additional time-keeping and man's copy of the service card is made out in the booth. When the workman finishes work on the job for the night, he turns in the first copy of his card, stating on it

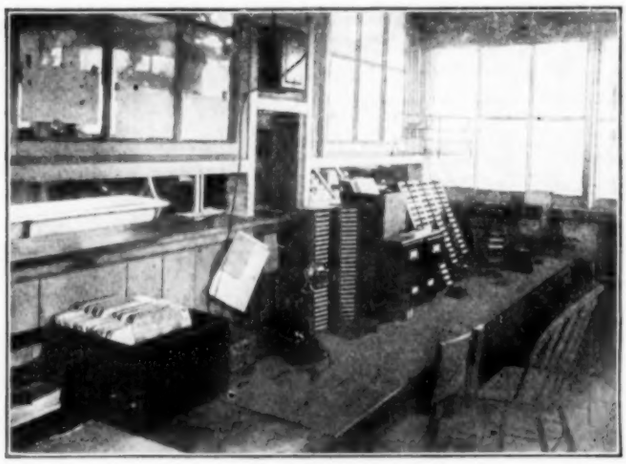


FIG. 45. INTERIOR OF BOOTH

the number of pieces that he has completed. This amount, subtracted from the number of pieces in the lot, is marked on the two copies of the service cards made out for the next day. The service cards which he has turned in are handled in the same manner as explained before. The second set is then placed in the time file, ready to be given to the man when he comes in to begin work in the morning.

If for any reason it becomes desirable to carry forward some of the pieces of the lot before the whole lot is finished, a complete set of service cards for all succeeding operations is made out for the quantity that is to be sent forward. If the original lot is No. 10, these delayed or forwarded pieces are given lot No. 10A, enabling them to go through the shop as a unit.

If a situation develops where a man working on a lot is called upon to stop work on that lot in order to let through some job that has fallen behind, the man's copy and the time-keeping copy of the service cards are rung out and are attached to the white copy, and put in the center pocket of the machine showing that the

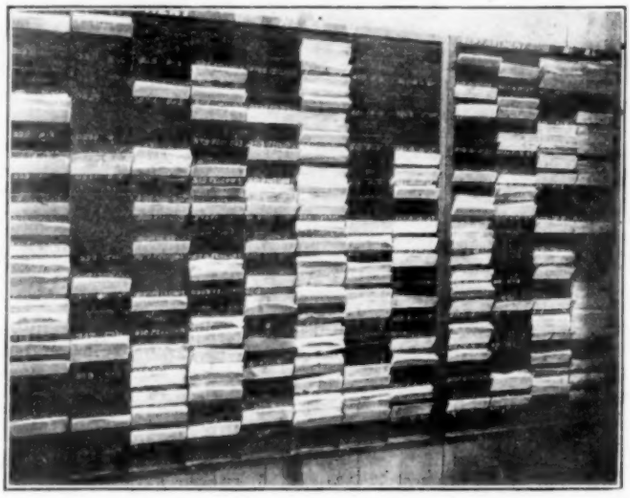


FIG. 46. THE PRODUCTION BOARD

job is at the machine and is to be worked on next. The new job is handled as described before. The partly finished lot should be finished up as soon as possible after the rush job is completed.

Notice for Final Inspection

When the last operation on a part is completed and the inspection report has been received on the manila copy of the service card, the quantity of good pieces is entered by the booth man on both copies of the in-slip and these are placed on the move board as a notice to take the parts called for into the final inspection.

The final inspector after checking over all pieces, signs the two copies of the in-slip, changing the quantity called for if any parts are rejected, and making out a rejection notice for the rest. The move man then takes the good pieces with both copies of the in-slips to the finished stockroom.

The finished stock keeper removes the in-slips from the work, checks the quantity again, and after entering the quantity on his record sends the pink copy to the cost department and the green copy to the production department.

The green copy acts as a posting medium on the operation check sheets and production record, after which they are filed by days for reference.

WGCo. MD26

Mach. No. | SET UP INSTRUCTIONS Tool Crib Copy | Date 6/1/19

Part No.	Operation No.	Lot No.	Man's No.	Material
D41-1	1	10	491	Mal. I

Operation Name Turn flange

Machine Name 202

Deliver all tools for the above operation to workman at machine indicated NOT LATER THAN 8 A.M. ~~P.M.~~

Time of Posting Notice 7 A.M. ~~P.M.~~

KLM

Booth Man

FIG. 47. SET UP INSTRUCTIONS (MADE OUT IN QUADRUPLICATE)

All of this talk of booth men, planning department and so on, might well lead the reader to believe that to plan production a large number of so-called non-productive clerical help would have to be put on the plant payroll. The contrary is true. For one thing, the stock-chasing force is nearly eliminated. The booth men do the work both of the time keepers and stock chasers. The accompanying table tells the whole story of what happened to the non-productive labor in the plant of the Warner Gear Co. when production was fully planned.

Department	Before Production Was Planned	After Production Was Planned	Increase or Decrease
Inspectors	118	74	—44
Truckers	42	23	—19
Production and planning	12	39	+27
Stock chasers	22	6	—16
Tool room	39	23	—16
Tool crib and tool grind	33	32	— 1
Shop clerks	26	13	—13
Sweepers	43	27	—16
Shipping	11	12	+ 1
Receiving	10	10	0
Millwrights	81	61	—20
Storerooms	42	40	— 2
Factory office	20	42	+22
Total	499	402	—97

Note that in spite of the greatly increased amount of goods which came in and went out of the plant, there was no increase of receiving clerks and only one additional shipper was put on. That is because their work, too, was planned so that it did not come "all in a bunch," but ran about the same, day in and day out.

The same reason was responsible for the cut in non-productive labor throughout. When work comes through irregularly, it is necessary to have enough men on hand to take care of the "peaks" which occur when a rush of work comes through. These same men are naturally more or less idle between the rush periods.

A well planned shop has no rush periods. Since the work flows evenly, each hour sees just about the same amount of materials moved by the truckers, and inspected. Hence fewer truckers and inspectors are needed. Even the work of the sweepers can be planned so that at a certain hour each day the same department will be cleaned and the sweepers will be moderately busy all day with no alternating periods of frantic rush and idleness such as is usually customary.

The reduction of 16 men, or 73 per cent, in the stock-chasing force of the plant under discussion was a direct measure of the reduction of emergencies. Most of the work now moves according to schedule and gets to its destination at the appointed time without being given any special attention.

So, too, the need for new tools is foreseen, and last minute orders for tools are avoided. A force of 23 toolmakers working full time now regularly handles more work than did the former 39 who were rushed one day and idly waiting for something to do the next.

Even though the number of men who give out and care for the tools was reduced by only one, remember that the production of the plant was increased 62½ per cent, which normally would call for a similar increase in toolroom attendants. The same holds true for such other non-productive departments as shipping, receiving, stores and so on; 61 millwrights now do fully 50 per cent more work than 81 formerly did, due to the fact that their work is foreseen and planned.

The staff of the production and planning department has been increased to 39 from 12. That was to be expected, but 13 of the increased number of clerks was transferred from the old factory office, the force of which has been cut in half.

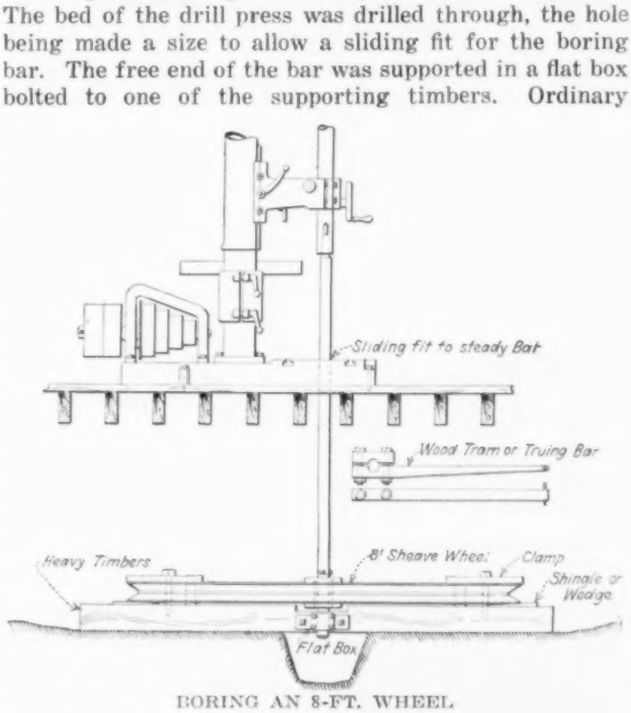
These savings in overhead are mere details, of course, but often they alone more than repay the change from unplanned to planned production. It must not be forgotten that the big advantage of planning is the increased production at lower cost which it makes possible.

Reboring an 8-ft. Wheel

BY J. W. GORE

While I was master mechanic at one of the large mines in northern Tennessee, we had an 8-ft. sheave wheel on one of the conveyors go to pieces. We found an extra wheel but to our unpleasant surprise the bore was only 3⅛ in., instead of the 4⅞ in. required.

The 24-in. drill press used for the job was located at a point in the shop where the floor was from 4 to 5 ft. above the ground, which permitted setting up the wheel on the ground, using four heavy timbers to support it. The bed of the drill press was drilled through, the hole being made a size to allow a sliding fit for the boring bar. The free end of the bar was supported in a flat box bolted to one of the supporting timbers. Ordinary



BORING AN 8-FT. WHEEL

shafting was used for the boring bar and on account of its length it had to be inserted into the machine spindle from underneath the shop floor. Preparatory to boring, the wheel was trued up, its exact position being determined by a wooden tram clamped to the boring bar.

Facts About the F. A. E. S.

How is the Federated American Engineering Societies to advance the interests of the individual engineer? By causing the advancement of the profession through a greater recognition, by the public, of the engineer and allied technologist; and by increasing the solidarity and raising the standards of these professions.

THE Federated American Engineering Societies will be successor to and will carry on the work of Engineering Council, broadening the scope of the work and standing for a much larger field. It is expected that the Federation will represent from fifty to one-hundred engineering or allied technical societies, whereas Engineering Council takes its membership from the four founder engineering societies only.

Reasons for Choosing the Name "The Federated American Engineering Societies"

As the later organization is larger in scope, so is its name more inclusive than that of Engineering Council. Forming a suitable name was the cause of much serious thought on the part of the committee on constitution and by-laws of the organizing conference. "Federated" was chosen in preference to "Association," "Confederation," "Federation" and others. "American" was used to make the name distinctive if our own shall be successful, because other nations are contemplating the formation of similar societies. "Engineering" is a broad word and was therefore chosen as the best single word to represent the membership contemplated. "Societies" indicates that the organization is one of groups and not of individuals.

Basis of Representation When Both State and Local Organizations Exist

The constitution provides that a state council or organization, representative of the engineers and allied technologists in the state, can be represented on the American Engineering Council, which is the executive body of the organization, on the basis of all the engineers and allied technologists in the state. If, however, there exists a strong local organization or affiliation, which elects to have its own representative or representatives on the Council, then the state council or organization is entitled to representation on the basis of all the engineers and allied technologists in the state, less the engineers and technologists that are to be represented through their local organization or affiliation. This will not prevent the local organization or affiliation from participating in the work of the state council or organization in the consideration of matters affecting the state only.

Money Contributions from Member Societies

The constitution and by-laws provide for funds contributed by the member societies for the support of the Federated American Engineering Societies. Inasmuch as it would be unreasonable for a small local society to pay as large a contribution as a national society the constitution provides that the contribution shall be on the basis of the number of members in the organization at the rate of $1.50 per member for national societies and $1.00 per member for local, state and regional organizations or affiliations. The individual, therefore, does not directly pay any dues but the member-society of which he is a member contributes to the support of the Federated American Engineering Societies on a per-capita basis of its membership. It therefore follows that any one who is a member of several organizations which hold membership in the Federated American Engineering Societies will be counted in the total membership of each society as a basis of its contribution.

The Federated American Engineering Societies will function through the American Engineering Council which will meet either annually, or bi-annually, as it will determine. This American Engineering Council will consist of representatives from the member-societies on the basis of one representative for from 100 to 1,000 members and an additional representative for each additional 1,000 members or major fraction thereof. From this body of representatives will be formed an executive board of thirty, consisting of six officers and twenty-four other members selected in part from the national societies and the remainder from the local, state and regional organizations or affiliations, according to the ratio of the number of representatives from the national societies to the number of representatives from the local, state and regional organizations or affiliations in the American Council. This executive board will meet monthly or as often as may be found to be necessary to properly transact the business of the American Engineering Council. There will be an executive officer who will also be the secretary of these bodies and who will be entrusted with carrying out their instructions.

The Organization Is Democratic

If a democratic organization is taken to mean one in which its constitutents have a voice in its affairs then the Federated American Engineering Societies is truly a democratic organization. Member-societies of this organization are represented on the American Engineering Council which has full power to control and to direct the activities of the American Engineering Council and of its executive board and can determine whether it is necessary for the former to meet annually, bi-annually, or tri-annually, or how frequently the latter shall meet.

On the basis of the present membership of Engineering Council the income from the contributions provided in the Constitution of the Federated American Engineering Societies would be about $75,000. At no time in the history of its existence has the budget of Engineering Council exceeded $50,000. Provision is made, however, that

> "The executive board shall, whenever practicable, provide for the whole or a part of the expense of members or of representatives attending its own meetings and those of the council."

On the basis of past experience, it is estimated that if the expenses of all the representatives on American Engineering Council and of the members of its executive board were paid to each meeting of these bodies, there would be involved an annual expense of about $25,000. The purpose of these expenditures is to secure a full attendance of the representatives of the American Engineering Council and on the executive board, especially during the earlier years of the organization. As will be noted in the excerpt from the constitution the expenses of representatives of the council and members of the executive board will be provided from such funds as may be available. If, in the judgment of the executive board this money should be required for more urgent work the expenses of the representatives and members would not be provided for.

Machining Methods in Pierce-Arrow Shop

By FRED H. COLVIN
Editor, *American Machinist*

Without going into complete details of manufacture, this article shows a few of the interesting methods and fixtures used by a well-known builder of high-grade trucks and passenger cars. Some of these are unusual, and full of suggestions for work of various kinds.

THE rough-turning of the pistons is done in the usual manner, after which they are drilled in the cylindrical drilling fixture shown in Fig. 1. The fixture is a sort of spool, the two heads, *A* and *B*, resting and turning in the supports *C* and *D*, which are bored to the same diameter. It will be noted that these supports are relieved in the center, which not only allows chip room but also avoids the necessity of having the arc an exact fit for the ends of the spool. The drill bushing is removable and is held in place by hooking the lip on the end under the screw *E*. After drilling one side, the spool is turned half way round, which brings the opposite bushing under the drill.

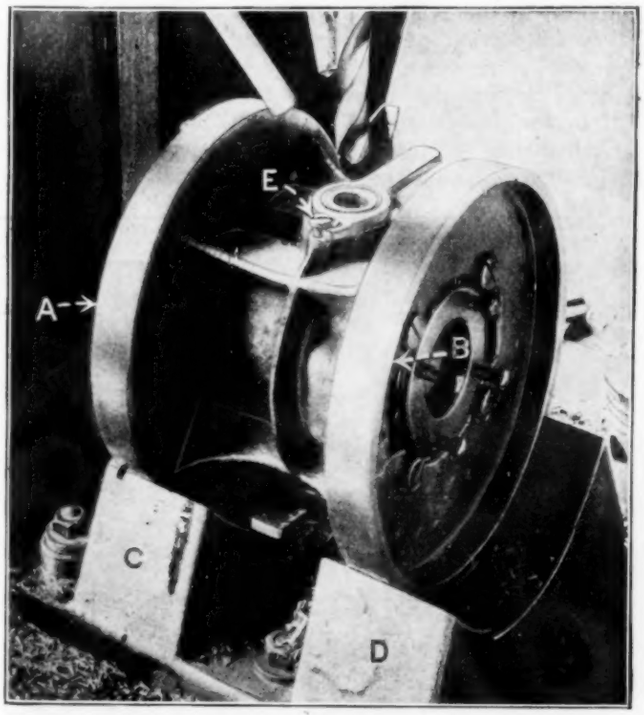


FIG. 1. PISTON-DRILLING FIXTURE

The details of the drilling fixture are particularly interesting owing to the unusual design. These details are shown in Fig. 2, where the open end of the piston *A*, which has been previously bored, is slipped inside the fixture and over the centering plunger *B*. Inside of this is a plug carrying the yoke *C*, which has V's on each side. These fit around the inside of the piston pin bosses and are provided with the spring *F*, which allows for slight inequalities and variations. Then the end plate *D* is placed in position and turned slightly so that the cam *E* locks under suitable lugs provided for this purpose. The two setscrews *FF* are then tightened and force the piston and the plunger *D* against the spring shown until the end of the piston stops against the pins *GG*. The hole is then drilled through the bushings *HH*, which are positioned by means of the index pins *II*, these fitting in suitable openings in the cradle which carries the spool shown.

It will be noticed that the plunger *D* is free to move

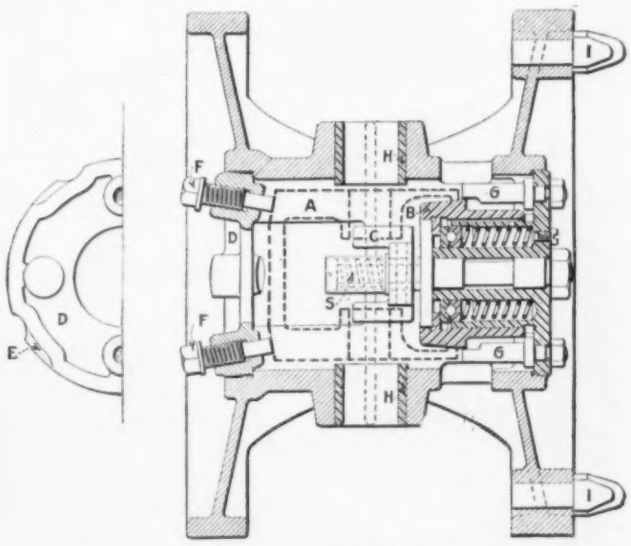


FIG. 2. DETAILS OF DRILLING FIXTURE

AUTOMOTIVE CONSTRUCTION

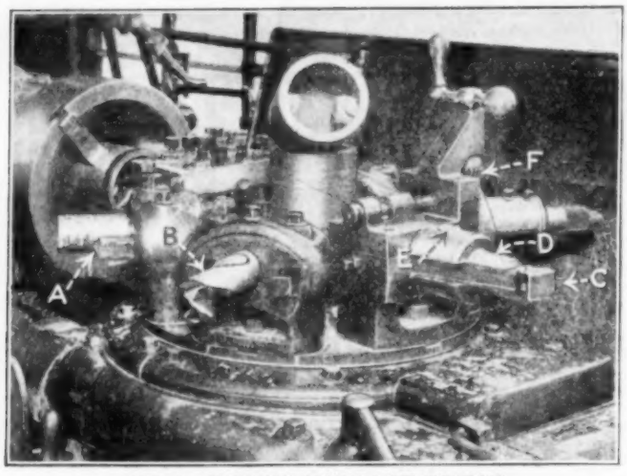


FIG. 3. BORING INSIDE OF PISTON

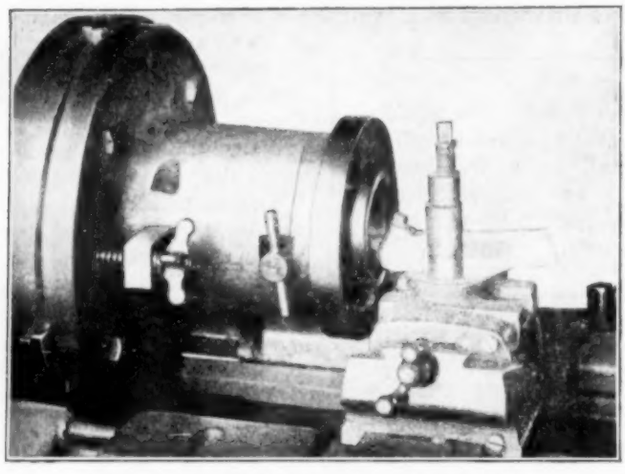


FIG. 5. FINISH-BORING THE OPEN END

around the central portion so as to allow the lugs to easily center themselves, a ball thrust being provided

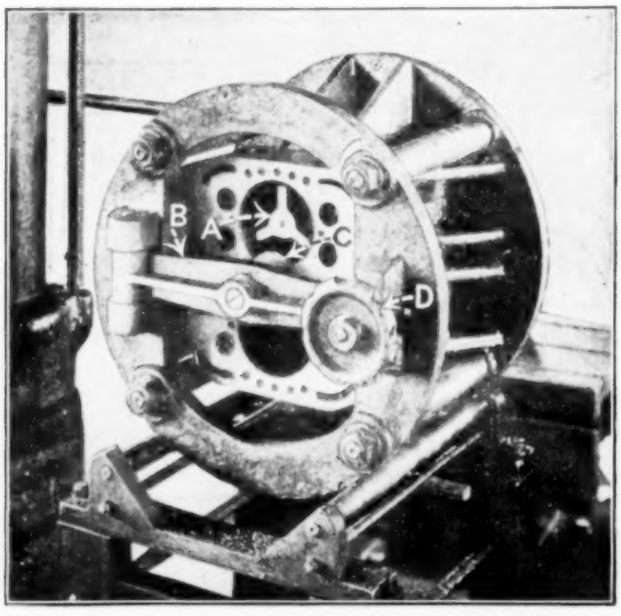


FIG. 7. FIXTURE FOR DRILLING CYLINDERS

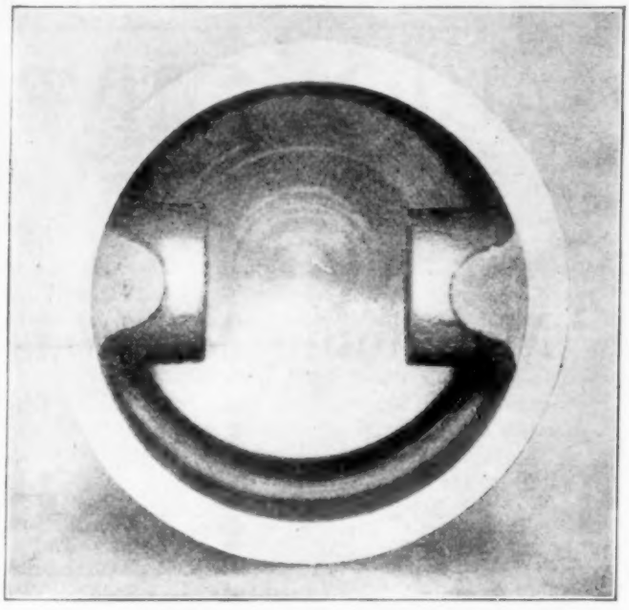


FIG. 4. HOW INSIDE OF PISTON IS FINISHED

at *X* for this purpose, and making a very complete and easily operated fixture for securing great accuracy.

After the rough-turning, the piston goes to the Jones & Lams machine shown in Fig. 3. The chuck used has a concave face, and the open end of the skirt is bored and faced by the tools at *A*. The drill at *B* is specially ground on the point and relieves the center of the piston head so as to make way for the inside facing tool *C*.

FACING INSIDE THE HEAD

This facing tool is held in a flat holder which can pass between the piston-pin bosses when the work is stopped in the proper position, the bosses clearing the reduced portion of the holder at *D*. The holder is pivoted at *E* and controlled by the handle and screw shown through the pair of beveled gears at *F*. This gives the facing tool *C* sufficient movement to face the inside of the piston head to an arc with the radius *EC*, thus finishing the inside of the piston except for

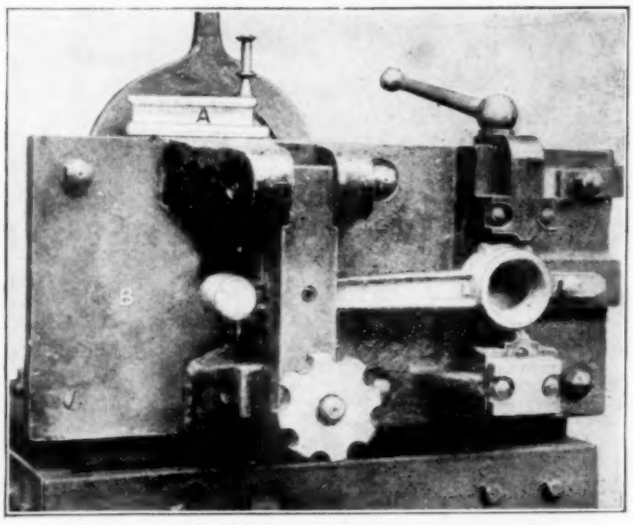


FIG. 8. TESTING CONNECTING-ROD FORGINGS

AUTOMOTIVE CONSTRUCTION

that portion of its length occupied by the piston-pin bosses. This leaves the piston finished inside as shown in Fig. 4.

Then the piston goes to the turning fixture shown in Fig. 5, where the open end of the skirt is carefully bored and the end faced square. Details of this fixture are shown in Fig. 6. The piston is simply slipped into the fixture shown and the hardened and ground locating pin *A* is slipped into place. This pin *A* is a close fit in the piston, but not in the fixture, as can be seen by the clearance around. The plate *B*, carrying the plunger *C* at its back, is then forced against the solid end of the piston by means of the cross handle *D* and the lever *E*. This moves the spindle forward until the projecting ends of the pin *A* seat against the hardened blocks *FF*, which give a definite distance from the piston-pin hole to the end of the skirt. This is then faced off to the desired length and is also squared with the piston-pin hole.

Another form of circular fixture is shown in Fig. 7, where the block of two cylinders is located by the three-lobed support *A* in one bore and a short stud fitting into the other bore. The cylinder block is held in position by the swinging arm *B*, carrying the contact pad *C*, the whole being forced into place by the hand-wheel *D*. Mounted in this fixture, the cylinder block can be turned to any position parallel with its bore for drilling or tapping the various outlets and other holes which surround the cylinder. The fixture rests on two rollers, which make it easy to turn.

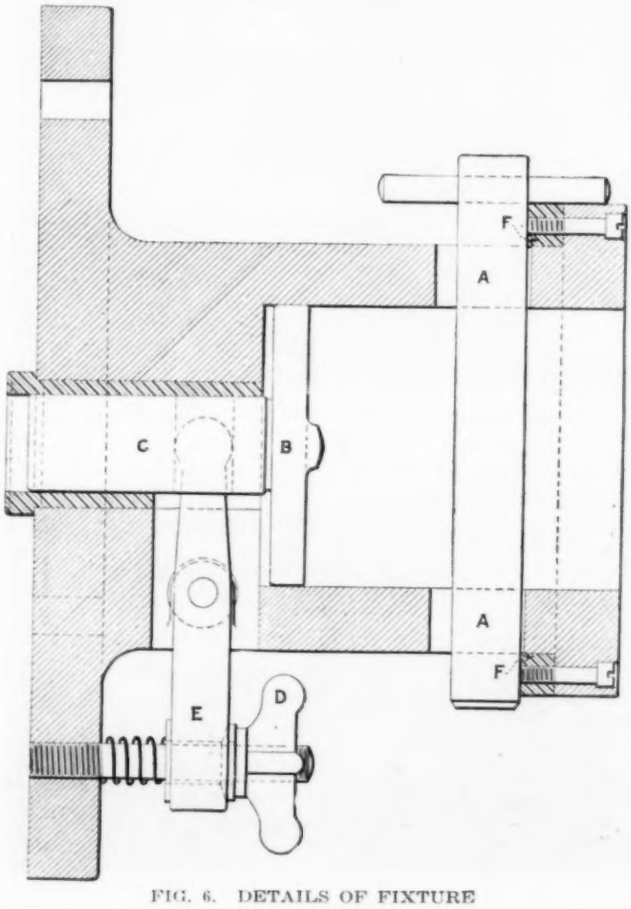


FIG. 6. DETAILS OF FIXTURE

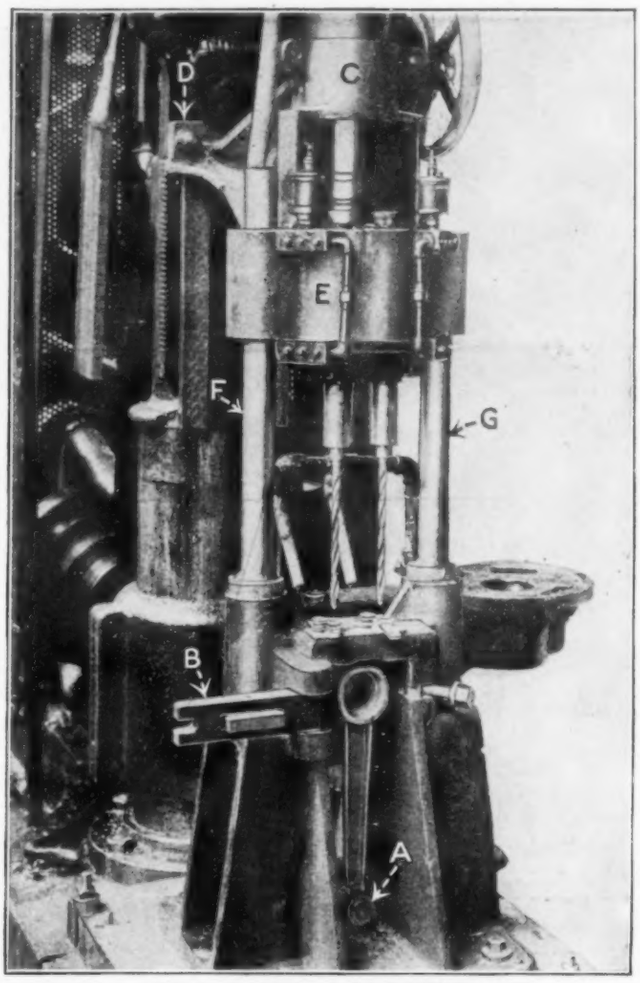


FIG. 9. DRILLING BOLT HOLES

The fixture for testing and straightening the connecting-rod forgings is shown in Fig. 8. The fixture holds the rod by a point in the channel near the small end, and also by the outside of the two bolt bosses. Held in this position the gage *A* tests the ends of the piston-pin boss by means of the two buttons shown on the gage stud. The surface *B* of the fixture is planed flat for this purpose. The whole gage is turned up on edge in order to be more clearly shown.

The next operation is the drilling of the small end, after which the two bolt holes are drilled in the fixture shown in Fig. 9. Here the rod is positioned by the piston-pin hole over the stud *A*. The swinging clamp *B*, carrying an equalizing pad in the center, clamps the upper end of the rod during the drilling operation. The drilling is done by a very substantial auxiliary head, which forms part of the fixture, and which surrounds the drilling-spindle guide at *C*, and bolts to the face on the column at *D*. The drilling head is contained in the housing *E*, which is guided by the pillars *F* and *G*, the whole converting a standard drilling machine into a special machine for this purpose.

The sawing of the cap from the rod is done in an extremely ingenious milling attachment shown in Figs. 10 to 13. This is a double-spindle machine, the first spindle carrying the slitting saw *A*, Fig. 10, and the

AUTOMOTIVE CONSTRUCTION

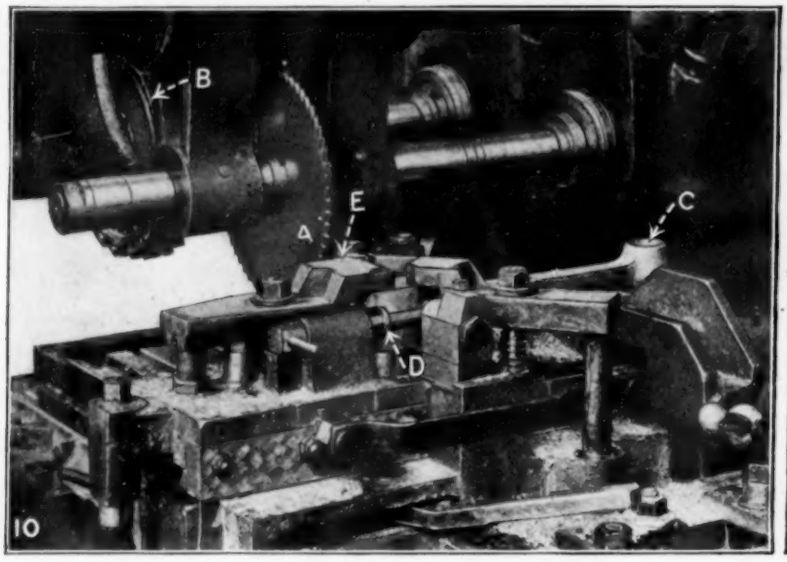


FIG. 10. SAWING AND FACING RODS AND CAPS

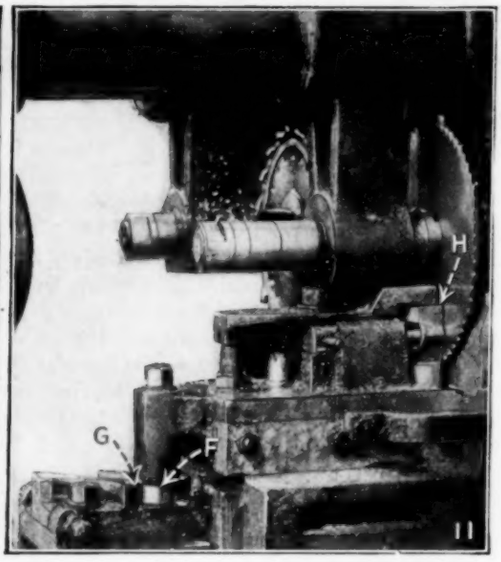


FIG. 11. END OF FIRST OPERATION

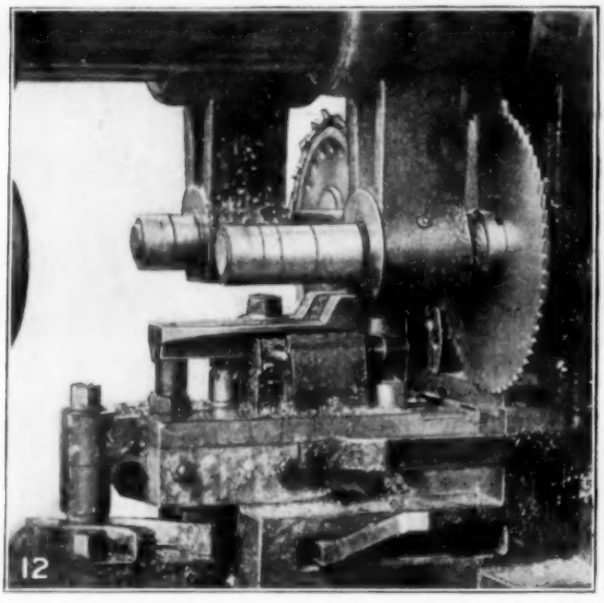


FIG. 12. MILLING THE JOINT SURFACES

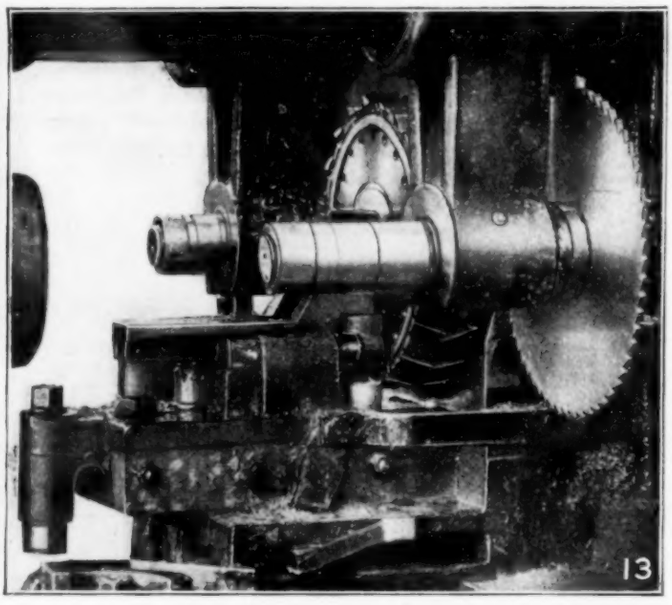


FIG. 13. FINISHING THE MILLING OPERATION

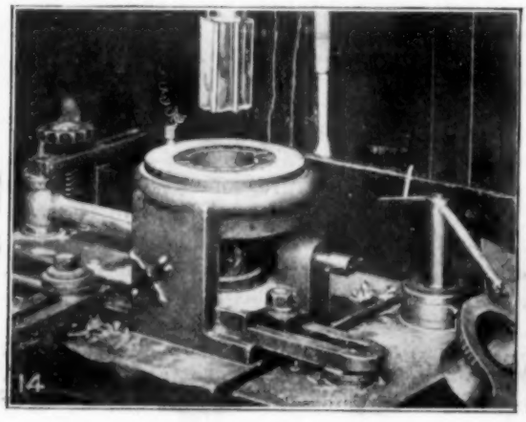


FIG. 14. REAMING THE LARGE END

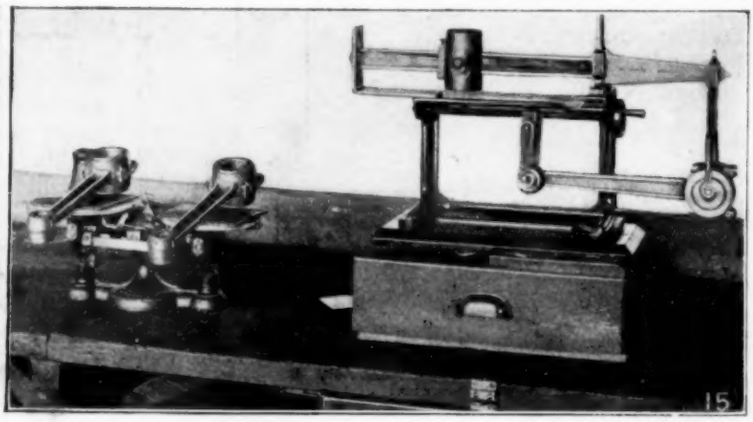


FIG. 15. WEIGHING THE RODS

AUTOMOTIVE CONSTRUCTION

second an inserted-tooth milling cutter *B*. The connecting rod is located by the piston-pin hole at *C*, the large end being positioned by studs in the bolt holes, as at *D*. It will be noted that the large end is clamped at three points, one of these being the broad clamp *E* which covers almost the entire cap.

As the table carries the rod under the slitting saw, the roller *F*, Fig. 11, approaches the sliding cam *G*. This figure shows the slitting saw having just finished the cut and the cap *H* beginning to move away from it under the action of roller *F* and cam *G*.

In Fig. 12 the portion of the fixture carrying the cap has moved out to its extreme position, the roller being practically at the end of the cam.

In Fig. 13 the inserted-tooth milling cutter is just finishing its cut, and has faced the joint surfaces on both rod and cap, so that they require no further attention. This replaces the former method of sawing off the cap and finishing these surfaces by grinding in a separate operation. This method insures the joint surfaces being at right angles to the bolt holes, which is a distinct advantage.

The rod and cap are then bolted together and the large hole bored and reamed. The fixture, together with the reamer, is shown in Fig. 14. The fixture has removable bushings to accommodate both the boring tool and the reamer.

The final weighing of the rods is shown in Fig. 15. The use of the plain balancing scale is to obtain rods of equal weight for the same motor, while the other scale weighs the large ends of the rods and enables the assembling department to use rods having the same weight at the large end.

Motor-Truck-Assembly Details

The very substantial type of pedestal used in erecting the heavy chassis of the Autocar truck is shown in Fig. 1. This is of cast iron and is used instead of wooden horses, being more substantial, reliable and durable.

It will be noted that a somewhat unusual method is used in bolting the springs to the axle. The nuts on the U-bolts have two lock washers, one between the first nut and the ear on the spring pad and the other between the two nuts. The illustration also shows the four, tight-capped substantial oil cups which are used for lubricating the bearing of the brake arm.

A Fender-Fitting Fixture

The assembling stand shown in Fig. 2 is in reality a fixture for fitting fenders of Autocar trucks. The stand, which is a bench having a cast-iron top, *A*, has suitable projections for holding the fender irons *B* and *C* as well as the crossbar *D* which represents the running board of the truck.

The fender irons shown are bolted to blocks which represent the frame, and allow the fender fitters to see exactly how the fenders are going to fit when they are put in place on the truck itself. The fenders are bolted to the irons and, with the irons in place, go to the chassis for assembly.

The left-hand fender is shown in place resting on the other end of the crossbar *D* and held by the fender irons. The gages *E* and *F* show at once whether the fittings line up as they should.

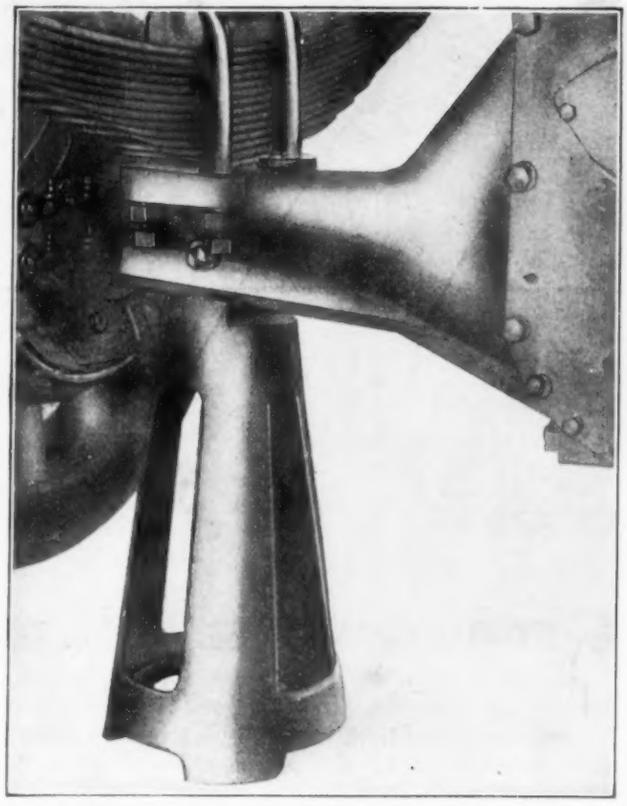


FIG. 1. A SUBSTANTIAL ASSEMBLING STAND

Fitting in this manner saves considerable time in the final assembly and insures everything being properly positioned when the truck leaves the factory.

Painting a Truck Chassis

Fig. 3 shows a very satisfactory method of painting auto-truck chassis or similar machinery, using the spray method. As will be seen this is done in a small room built especially for the purpose. The chassis is mounted on a double-castered truck, and the bright parts protected as at *A* and *B*. The caps *A* which slide over the

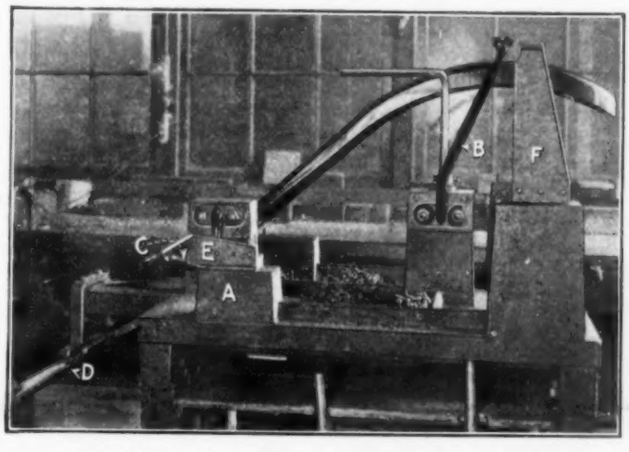


FIG. 2. FIXTURE FOR FITTING FENDERS

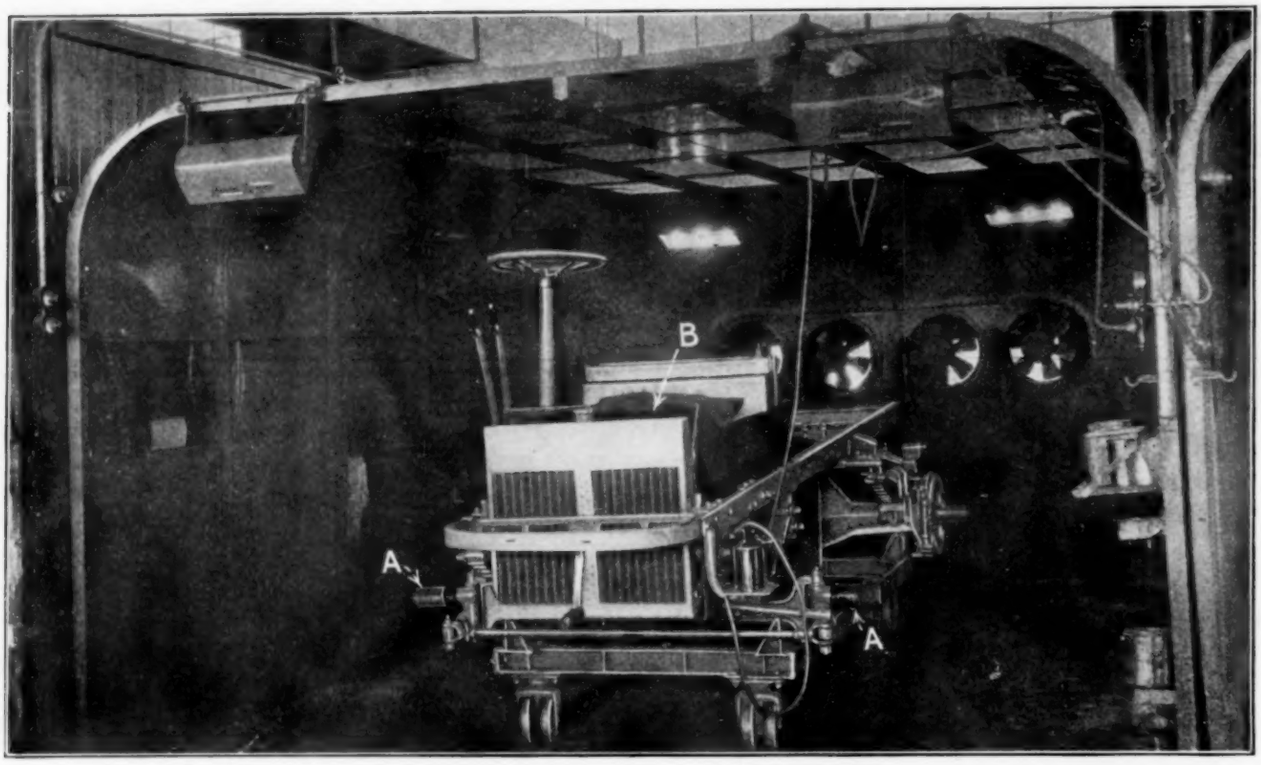


FIG. 3. PAINTING THE CHASSIS

axles can be of any light material, and the top of the motor is protected by the pieces of sheet metal or cardboard shown at *B*.

Illumination and Ventilation

Skylights of wired glass allow considerable daylight to filter through into the room and the four groups of lamps, two at each end, give all the additional illumination necessary. There are also four exhaust fans at the back, each independently driven, so that any desired degree of ventilation can be obtained. After a chassis has been spray painted, a canvas cover is let down over the front of the room, protecting the paint from dust until it sets.

An Executive "Follow Up"

By W. Burr Bennett

President, Wayne Engineering Co., Honesdale, Pa.

Most men in executive positions will admit that one of their most trying jobs is to see that their orders are executed. Even in the small shop where the contact with the various department heads is closer than the large shops, it is difficult to see that the dozens of daily instructions are carried out. It is especially true now when even the best of men are afflicted with that great American disease of "Let George do it," which is further complicated by the high fever of "Passing the buck."

Notwithstanding the fact that the modern progressive shop is well equipped with a planning, production and cost-keeping system, the various employees who are burdened with the aforesaid afflictions can manage to "overlook" about 50 per cent of the various small details assigned to them.

As a corrective measure and by way of living up to one of the late H. L. Gantt's axioms, which stated that "The authority to issue an order involved the obligation of seeing that it is properly executed," the form shown herewith was devised. It is printed on the convenient 8½ x 11-in sheet. A new sheet is used daily and carefully filed when complete. The various details are noted opposite the proper department and the head of that department is required to state the date when he will promise completion of the task assigned. If the time is three weeks away the first follow up is made by a personal interview a week later and is noted in the column 1-FU which is a symbol for first follow up. This is carried through for the second and third weeks respectively and when the task is completed the date is noted in the date finished column. Of course the times vary, some are taken care of at once, in which case only the finish date is noted; on the other hand some items take three days or even three months.

This scheme has now been in operation about six months and has been found very satisfactory. It is simple, accurate and when carefully followed gets results.

MAINTENANCE DEPT.	TOOL ROOM	FINISHING DEPT.	ASSEMBLY DEPT.	SHIPPING	STORES	PRODUCTION DEPT.	ENGINEERING DEPT.	PLANNING OFFICE	BUSINESS OFFICE	DEPT. HEAD	DATE
MR. BROCK	MR. FOX	MR. JAYCOX	MR. BAUMAN	MR. ROBINSON	MR. HEPT.	MR. FOX	MR. COMMSKEY	MR. DUDLEY	MR. KRANTZ	ITEM	EXECUTIVE FOLLOW UP
										DATE FROM	
										DATE 1-FU	
										DATE 2-FU	
										DATE 3-FU	
										DATE FIN.	

FOLLOW-UP FORM

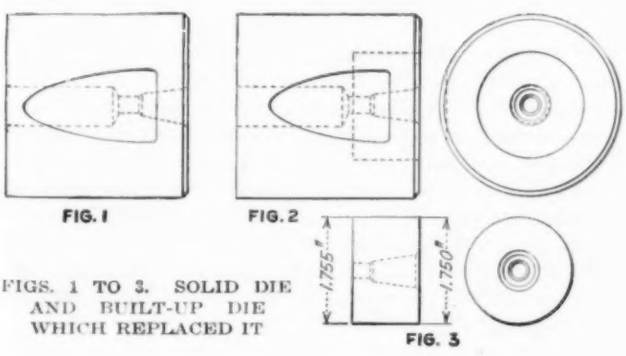
Methods of Making Cold Header Dies

By H. W. Armstrong

The writer redesigned some header dies in a way which may be of interest to others on similar work. The dies which we had been using in our shop were made as shown in Fig. 1, of solid steel. If properly made and hardened they lasted quite a while, but if they were too soft they would be used up quickly. On the other hand if too hard they would split open. In any case they are quite costly to make as there is required a large piece of tool steel of very good quality.

The writer thought that by substituting a soft steel exterior and using a tool steel center (see Fig. 2), the cost of steel could be greatly reduced. Moreover the tool steel insert weighed less and could be handled more easily when machining. Also the exterior or holder could be used indefinitely, substituting new inserts when necessary. This method had been tried before but without success because the insert had been made with the sides straight or parallel, The holder was bored out slightly smaller after which it was heated and the insert shrunk into place. This method failed because the insert would very often pull out and sometimes would get caught between the punch and die, causing serious damage.

The following method was then tried out with success and adopted. The holder was bored out on a slight taper, the greatest diameter being at the bottom and about 0.004 to 0.006 in. larger than at opening. The insert was made with a corresponding taper but about 0.005 in. larger throughout than the hole in the holder (see Fig. 3). Then the holder was heated and the insert shrunk into place. None of these have ever pulled out as the taper-shrunk fit will not permit the insert to pull out without subjecting it to a greater strain than is possible under working conditions.



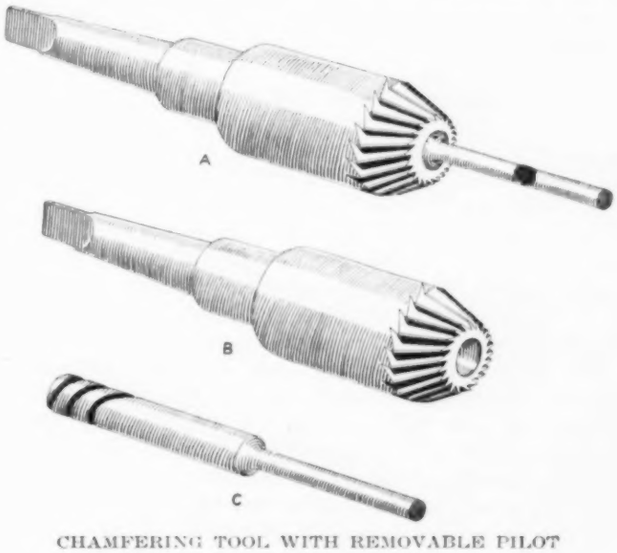
FIGS. 1 TO 3. SOLID DIE AND BUILT-UP DIE WHICH REPLACED IT

Chamfering Tool for Valve Seats

By J. V. Hunter

A maintenance engineer in a large gas engine manufacturing plant recently stated that in the past they had trouble due to the pilots on the chamfering tools, used for finishing the valve seats, wearing rapidly and causing them to chamfer the seats out of true with the valve-stem holes. This was caused by the chips and dirt that fell down on the pilots which were made integral with the tools.

This trouble was done away with entirely by using the type of tool shown in the illustration. *A* is the assembled tool and *B* and *C* the two parts of which it is composed. The body is made as at *B* with the center hole accurately finished to a standard diameter. The pilot *C* is likewise made up with its shank the correct size for a snug running fit in the tool bore; and it will be noted that it carries oil-grooves to distribute the oil and insure that it will not bind in the bore. The pilots are made in several sizes, varying a fraction of a thousandth from one another, and in each case the operator selects one which will fit tightly into the valve-stem hole which he is chamfering. The tight fit insures the pilot both against side play and turning in the hole, so that the rotation all occurs on the upper shank which is above the chips and dirt. Since using these chamfering tools the inspectors have found less cause for complaint and the maintenance for the tools has been much less.



CHAMFERING TOOL WITH REMOVABLE PILOT

What Other Editors Think

Which Way Are the "Trade Winds" Really Blowing?

By Everit B. Terhune
Manager, *Boot and Shoe Recorder*

IT is high time that a certain type of American business men cease worrying, and take comfort from some plain, easily discoverable facts.

I am getting a growing conviction that in some commercial quarters pessimism is masquerading as marvelous shrewdness, far-sightedness, conservatism.

I sense a tendency on the part of a few business men here and there to construe present *unusual* commercial conditions as the inevitable forerunner of *panic* conditions.

If one has the interest to chase this pessimism to its source, then puts that source under the magnifying glass of intelligent, uninflamed business analysis, of what does he find it to consist?

Just this: Commodities are very high; the consuming public is crying more nearly in unison every day for lower prices; labor is in an aggravated state of unrest; and commercial, social and political conditions in Europe are generally bad.

Granted—every bit of it!

But, even so, please permit some of us to retain our mental equilibrium; bear with us while we decline to become frenzied over these things, and allow us for a moment to put the facts through a laboratory test.

Which way are the "trade winds" *really* blowing?

So far as I know, or can find out, no business depression in the United States ever occurred in or immediately followed a period in which money was anywhere nearly as plentiful as it is today and has been for two years—with a record-breaking bold balance to justify and even *necessitate* it.

So far as I know, or can find out, no commercial cataclysm in this country of ours has ever come at a time of conspicuous *under*-production of *necessities*. Over-production *has* been a contributing cause of business lethargy.

And so far as I know, or can find out, no real business paralysis has ever accompanied or immediately succeeded a time when the working man—or the farmer—was anywhere nearly so much the master of his financial destiny as he admittedly is today, and is admittedly going to *continue* to be for many years.

Truly, I think the well-known volatile temper of the American business man has never been more strikingly demonstrated than in this silly inclination on the part of a few of him to mistake the probably approaching *readjustment* of commercial matters for a *stagnation*.

And here, I think, we get the real answer: We shall have a *clarifying* of industrial relations, a *straightening-out* of commodity values, and perhaps of trading prices and profits ratios—but a panic, a business depression, a period of radical commercial curtailment, *NO!*

I am quite satisfied to let the coming twenty-four months prove me a false or true prophet.

What I am principally quarreling with is the superficial character of the judgment that a few self-appointed calamity-howlers always insist on applying to a business situation whenever it is anything but 100 per cent rosy.

They like to interpret a prospective, natural easing-off of abnormally high prices as bottom-dropped-out affair.

They view an upset labor situation as forecasting an industrial tragedy—entirely forgetting, apparently, that a labor crisis never comes when production of living necessities is tremendously under normal requirements.

To them the unparalleled accumulation of gold reserves in this country at present, with its unavoidable influence toward high prices, high wages and popular extravangance, means nothing at all!

Two years ago everyone was proclaiming, truthfully, that "business in the United States is just entering an era of the greatest prosperity it has ever known."

Right! — and we ARE in it, and, if we will merely ignore or suppress the stupid croakers, we shall easily continue in that prosperity for many, many years!

The War set the international stage for this precise prosperity. By it we became, involuntarily, uncontrollably, the logical supply source for a good share of the rest of the world for the major part of *ten years*.

Do we business men of the United States now propose throwing this advantage—this responsibility—to the four winds, merely to give foolish substance to the frothiness of a few false prophets.

I talk business with a great many men influential in the shoe industry and in other lines; and, believe me, I get *facts*.

If I should epitomize the worth-while statements made to me of late by the worth-while men of business, they would come down to about *this:*

"Let's not even dream of poor business while all about us we have, and must for a long time have, the elements that always make business *secure*."

"Any business man who thinks he can forsee commercial depression when his own country and half the rest of the world are clamoring for goods ought to be surveyed by an alienist!"

"We should at least scratch the surface of our tremendous trade advantage before we begin to wonder if we have exhausted it."

I want to say that business journalism is an excellent barometer of coming business conditions. Advertisers are as canny as they make them! An advertiser can scent a distant slump in business more keenly than any other kind of business individual I know.

Yes, prices are going to be revised downward, some time; broadcast personal extravagance is going to run its course, and prosperous sanity return; labor is going to rub its eyes clear and jump enthusiastically into the pleasant and profitable work of making production more nearly match the demand for it.

Who are going to straighten out the situation, and bring America's business to its proper basis *without* interrupting it?

The *American people themselves*—of course

The Van Norman No. 9 Hole-Grinding Machine

SPECIAL CORRESPONDENCE

THE grinding machine illustrated and described in this article has been brought out by the Van Norman Machine Tool Co., Springfield, Mass., and is intended for finishing holes by grinding and also for grinding the flat faces of circular work, the work being held in a chuck or other suitable fixture.

Figs. 1 and 2 are respectively front and rear views of the machine and show its massive construction. The base has ample strength and rigidity to keep the work and grinding spindles in alignment with each other under the most severe grinding conditions, thus insuring straight work.

The drive is self contained and is mounted on the machine base, avoiding the necessity for an over-head system such as is usually furnished with belt-driven grinding machines. The machine can be furnished with motor drive, in which case the motor is placed inside the cabinet base where it is protected from grit and dirt. Here the motor is entirely out of the way and by reason of its location the machine does not require any additional floor space. All driving shafts are mounted in self aligning ball bearings.

Production grinding requires that the stock to be removed shall be taken off in the shortest possible time. In conforming to such requirements it is necessary that both the work and the grinding wheel shall be rigidly supported and absolutely free from all vibration.

Fig. 3 shows the construction of the work-head spindle and its bearings. The spindle is submerged in oil and is protected by a packless gland system that seals oil in and dirt out. The grinding-wheel spindle, Fig. 4, is mounted on a quill which can be adjusted lengthwise in the grinding head. Ball bearings are provided both at the front and rear end. The front bearing, or that nearest the grinding wheel, is fixed in the quill, while the rear bearing is held in a sliding bushing. By this arrangement any lengthening of the spindle by expansion due to heat generated by grinding, will cause the rear bearing to be pushed back by the shoulder on the spindle and prevent any binding between the shoulders. The quill is designed to give rigidity to the spindle under the severest conditions imposed by heavy grinding. It is not intended that the wheel spindle is to be removed from its quill for the purpose of inserting another spindle of different size or length but that a quill fitted with a spindle adapted to the work shall be used.

An analysis of grinding-machine production will show that the factors of time consumption are: loading the machine, actual grinding, gaging, unloading. Rapid production, especially in grinding holes, requires that the machine shall have been designed with the above factors in mind, otherwise the time consumed in handling and gaging the work will be out of all reasonable proportion to that consumed in actual grinding.

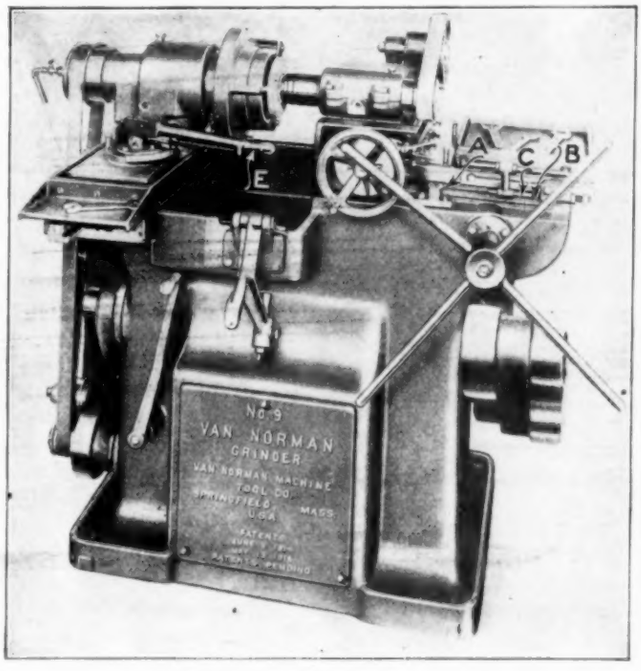


FIG. 1. VAN NORMAN NO. 9 HOLE-GRINDING MACHINE

Specifications: Swing, 20 in. Will grind holes 4½ in. deep. Speeds: work spindle, six, from 72 to 431 r.p.m.; grinding spindle, three, from 3,400 to 19,000 r.p.m. Motor: 3 hp., 1,200 r.p.m. Floor space, 39 x 63 in. Weight: net, 2,950 lb.; boxed, 3,100 lb.

Probably no factors limit the production capacity of a hole-grinding machine to so great an extent as those of loading, gaging and unloading. The reason for this is the natural slowing up on the part of the operator, owing to his fear of contact between his hands and the abrasive wheel which is unavoidably very close to both the work and the chuck or holding fixture. To stop the wheel each time the work is to be gaged or unloaded or loaded would result in an enormous loss of time.

In designing this machine the maker has taken care to protect the operator's hands from accidental injury while handling work in and out of the machine and during the times it is necessary for him to gage or otherwise test the parts being operated on. This safeguarding consists in supplying means by which the distance between the work and the grinding wheel can be quickly made greater in two directions.

Referring to Fig. 1 it will be noted that the carriage upon which the grinding spindle is mounted is provided with means for longitudinal movement through a pilot wheel and rack and pinion. This movement is limited by the positive stop *A* and the adjustable stop *B*, between which is hinged the bar stop *C*. By swinging the bar stop *C* upward and out of line with the other stops, the carriage can be moved back, withdrawing the grinding wheel axially from the work.

The work head is mounted on a transverse slide upon

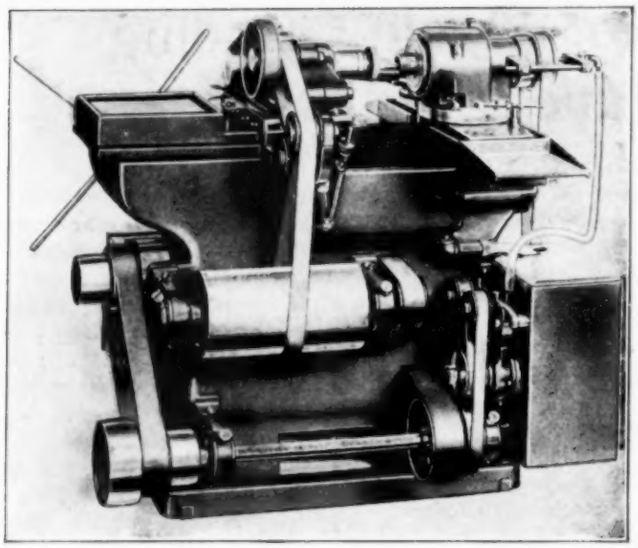


FIG. 2. REAR VIEW OF GRINDING MACHINE

which it can be moved by the lever *E* through the usual rack and pinion arrangement. It will thus be seen that with the wheel moved axially away from the work by the movement of the carriage, and the work moved transversely away from the wheel by the movement of the work head, there will be ample room for the operator to gage the work and to handle it in or out of the machine without danger of injury to his hands.

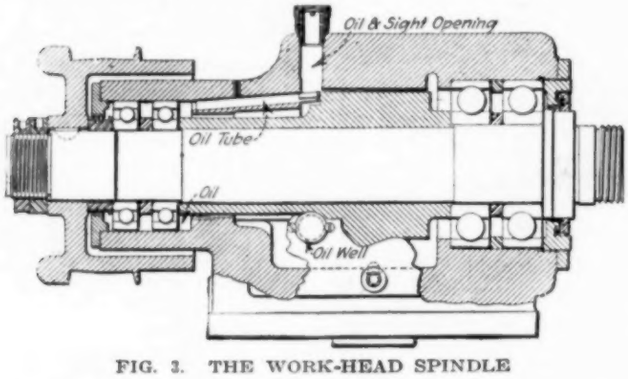


FIG. 3. THE WORK-HEAD SPINDLE

There still remains the necessity of stopping the work spindle from revolving before the work can be handled or gaged and this is taken care of by releasing a clutch and the automatic application of a brake which brings the spindle to a quick stop. The operator can make all these moves quickly while maintaining a posi-

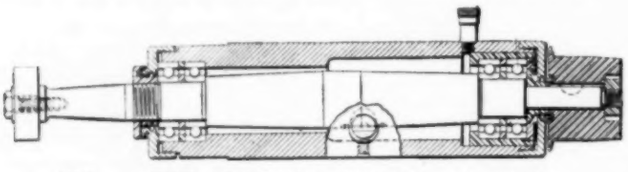


FIG. 4. THE GRINDING SPINDLE AND QUILL

tion of ease and the time consumed will be much less than if the grinding wheel were stopped and started.

The work head can be returned to and locked in its normal position without change in alignment.

By the use of a cup wheel holes can be ground and the work faced without changing the wheel or re-mounting the work. In face grinding, the work head is traversed while the wheel remains in one position. Adjustable stops are provided on the work-head slide through the use of which the head can be set in different positions so that holes having more than one diameter can be ground. The work head is mounted on a swivel base graduated both in degrees and in taper per foot so that taper holes can be ground to either system.

The machine is equipped with a wheel turning attachment and a pump for coolant.

Making Employees Interested in Their Work

BY OREN D. HARRIS

Excellent and instructive as is Professor Kitson's article in the May issue of the *American Machinist*, on "Making Employees Interested in Their Work," it is by its very nature broad and of only general application. Several points occur to me wherein his general deductions may be specifically applied to increasing the interest of employees, particularly in mechanical lines of production. Perhaps none of these applications can be classed as original, but if there is "nothing new under the sun," it is at least interesting to note how Old Man Experience follows right along the line of Professor James's arguments—or, perhaps, this should be said vice-versa.

At any rate, it seems to me that in one thing at least the machinist trade has an incomparable advantage over most other occupations. I do believe that, as a rule, there is a greater interest in the work itself and in the opportunities presented by the whole engineering business shown by those entering it than in almost any trade or occupation, possibly barring what our grandfathers used to call "the learned professions."

Perhaps the shop paper could be used to induce a little more curiosity as to the contents of the factory library, and encouragement should be given to the workman in the matter of individual subscriptions to technical magazines. Part payment by the employer of the purchase price of study courses pursued by workmen will give encouragement, without forfeiting the sense of responsibility which might result from having the whole amount assumed by the employer. In some cases a well-managed suggestion box proves a benefit by bringing out useful suggestions and by making the men think beyond the beaten track. The amount of the reward and the actual fact of winning it are both sufficient inducements to cause a worker to keep on looking for inefficiencies which can be remedied.

Attention to the comfort of employees in the matter of simple conveniences will result not only in greater interest, but in greater producing efficiency as well.

In the matter of getting employees interested in their work by showing an interest in their welfare outside of the shop, the first step of many employers is the promotion of sports, which will be of interest to only a small number of the younger men as a rule, rather than to the more mature men. The method in which many firms are now offering to help their men accumulate savings by giving them cash dividends, stock dividends, and by maintaining convenient branch banks will likely to appeal to the most responsible of the men. The plan of helping finance the buying or building of homes should be one of the surest means of encouraging loyalty and interest, especially in these days of the scarcity of houses.

Hunting Psychologists

By Entropy

This is not an advertisement. The job is filled. One of my friends who runs a shop with quite a good-sized office attached asked me to locate a psychologist who could discover whether his organization was good or not. Of course I made him sign off all claims against me in case the man did not prove profitable. Then I answered advertisements which implied that psychological methods of selection were to be used. The first chap I struck had advertised for a cashier. Handling money has always appealed to me so I went to see him with some real interest; but he apparently was quite a psychologist for he told me immediately that I did not want the job, because his firm did not intend parting with money enough to keep me going. He explained that he knew by my looks and the fact that one button on my coat was nearly off that I was married and he did not see how any married man was going to carry the job and dress as well as I did. I did not get anywhere near his psychological tests.

The next ad that I saw did not give any details at all. They gave a box number and asked for an executive. Being an executive always appealed to me, my idea of an executive being a man who has a nice flat-top desk with nothing on it but a plate glass and a calender marked with the date the fishing season opens. Bearing in mind my experience with the first man, though, I carefully selected my other suit, the one I wear holidays to take out the ashes. My wife very kindly sewed all the loose buttons on, and I dusted it off as much as possible, being careful not to disturb the shine on the elbows and other prominent places.

This chap was posing as an imitation of a seal, being one of these self-satisfied fellows with long hair combed straight back and oiled to the last word. He started off by telling me that the examination through which he proposed to put me would demonstrate whether I was fitted for the job or not, so that I would see if I fell down, that I was unfit for the job. In other words, there would be nothing personal about it. Now I feel quite proud of one or two things I have done and I tried to tell him all about it. He waved me away with the remark that he cared nothing about my past, only of my future. Then I tried to find out what he wanted his man to do. He said he was not allowed to tell, that all he was going to do was to find the man best fitted for the job that was to be handed out, and then they would hire that man.

I suggested to him that I had spent a lifetime in certain lines and that I did not want to wander too far astray from them. "Why," said he, "if you can get a good job with plenty of money, what do you care what you do?" I then dug out of him that what he thought was good money was about $1,800 a year. I made a mental reservation, but told him to go ahead with his questions. He had nothing new, however, just the old line that tests concentration by asking foolish questions, memory by photographs, and association of ideas and all the rest of the stuff that has been public property for five years. I passed, but I felt obliged to tell him that the job, which he finally said was selling bonds on commission, was nothing that I wanted. The whole game was to get men so imbued with the idea that their minds were of just the type to sell bonds that they would go out and sell to all their personal friends and then they could be discarded in favor of a new crop. I did not recommend the imitation seal.

Then I struck a man who did not claim to be a psychologist at all but whom I suspect of such leanings. I met him by accident and was not dressed to make any particular kind of an impression. He started off by telling me just what the job was that he wished filled, just what sort of people the man selected would have to co-operate with and just who could be expected to object to co-operation. He then drew out of me all my experiences that bore on the job, some of which I will have to admit now were made up for the occasion. After we had talked for nearly an hour he and I agreed, however, that I did not want the job, and then he turned around and told me that he had known all along that I was not looking for a job at all

Which Was a Psychologist?

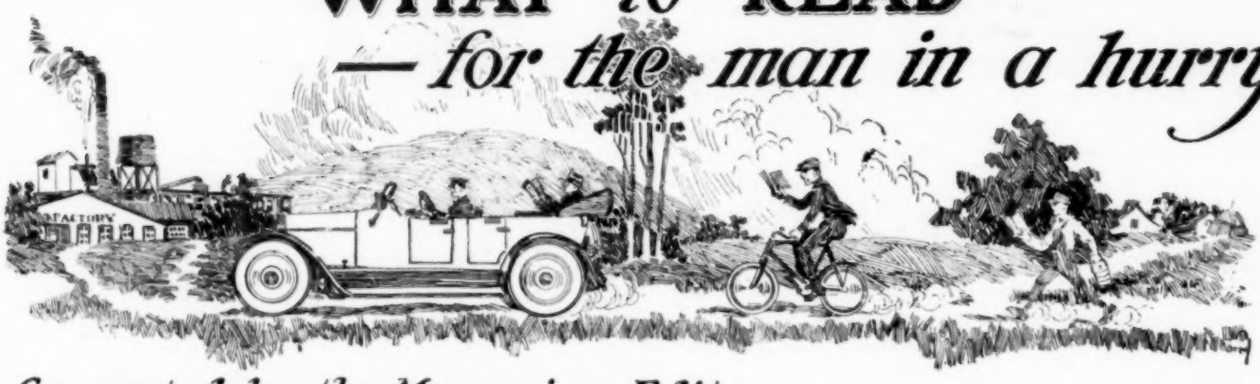
Of the three, which was the psychologist? Or, if they were all in that class, which is the type that can find a useful place in the world? Is it justifiable for one to entirely throw away the experience which he has gained by hard work? Is it reasonable to expect that every man who comes looking for a job is down and out and therefore ready to take any job that promises a fair living? To be sure, most of us work for a living, but most of us can earn more in a congenial job, and one for which our past work has been a preparation. Psychology, as I understand it, is the application of common sense to the workings of the human mind. The mind is perverse under affront and insult. If it is desired to rouse a man's antagonism the easiest way is to tell him that he is not competent to pick out his own kind of work. It may be that he is not competent, but it is very far from soothing to him to tell him the truth even in that case.

Everything that we do forms habits, good or bad, as the case may be. Habits are worth money in the market or they cost money. The habits of honest and clear thinking are assets, those of laziness and procrastination are liabilities. These can be estimated from the history of the man. All the tests which may be applied may find him prepared, and he may, under the stimulus of excitement and interest, pass an examination in a way that his habits make it virtually impossible for him to keep up. A man may be able to center his attention for a short time on an interesting or new problem and yet be so utterly bored with the repetition of the same problem that he may make so many errors that it is not profitable to employ him.

Will-power hardly comes within the scope of these short examinations. Men who have shown wonderful will-power at one time have apparently entirely failed to show it at others. The state of physical comfort has a great deal to do with it. The presence or absence of disturbing affairs which call for their own share and more of will-power, can only be guessed. A man may be asked to present himself for examination at a time when his wife or child is sick and he is using all the will-power that he has to keep up his courage, and he is likely to make a sorry exhibition when called on for evidence of more.

And so in a great many ways it is unwise to throw away records of past performance. It is true that each employer is concerned chiefly with the future, but if he throws away the past he has lost a great deal of value for judging the future.

WHAT *to* READ
—*for the man in a hurry*



Suggested by the Managing Editor

A LITTLE sketch of our naval station at Pensacola opens the ball this week. The illustrations show some of the every-day work with big flying boats at the station. Two other automotive articles appear on pages 221 and 225. They are both by Fred Colvin and deal with two of our oldest motor vehicles, the Pierce-Arrow and the Autocar. The Pierce article takes up the high spots only of some of the operations on pistons, cylinders and connecting rods, but gives details of interesting fixtures. From the Autocar shop come assembling and painting helps which are ingenious. An automotive kink from the western editor is printed on page 227 and strikes us as being worth noting. It is a valve-seat chamfering tool with detachable pilot to get away from chip difficulties.

What to read was not a difficult matter to decide two hundred years ago when books were few and magazines unheard of. It is far different now when so much reading matter is offered to pass the time pleasantly or profitably as the reader chooses. We are doing our utmost to make the "American Machinist" not only profitable but indispensable as a clearing house of ideas and news of the machinery world. This page is the editors' advertisement of their section of the paper. It gives the high spots.

The Ordnance Department, through Colonel Barnes, sends us an account of a test on large roller bearings made in the famous Emory testing machine at the Watertown Arsenal. Performance data on 12-in. roller bearings are scarce and the results of this test are therefore doubly important.

A special machine for railroad shops is described by Cedric Priebe, our youngest editor, on page 202. It was built by the Garvin Machine Co. for milling slots in crossheads and for work of a similar nature.

A new grinding machine which is finding its share of favor is the Van Norman of which an account begins on page 229. It is a production machine for finishing holes by grinding and also for grinding the flat faces of circular work. Some of the first ones have gone to the automotive industry.

More of our old friend Entropy's homely philosophy follows the Van Norman article and once more we commend his remarks to your thoughtful attention. This week he takes an exploring trip into the realms of man training and arrives at the conclusion that it is a very rich territory from which much is to be gained.

The period in our history from 1810 to 1840 saw many far reaching developments in the machinery world. H. H. Manchester discusses them in Part XI of his Evolution of the Workshop, page 205. Among them were the first American-built steamboats and locomotive engines, nail and tack making machines, milling machines and tenoning machines and the extended use of interchangeable parts. Here is one of the results of a micrometer test which C. A. Hubbell, president of the T. R. Almond Co., describes on page 209. "A rather unexpected condition appeared in the large number of micrometers inaccurately set at zero. . . . Fifty-two per cent of the employees' instruments were correct at zero while only 20 per cent of the employers' were correct. . . . it is quite universally nobody's business to look after the firm's tools." Have you had yours tested lately? "Modern Production Methods" appears again this week with Part VIII, which covers the control of the work in the shop or, more briefly, planning. The "booth" system is described and its advantages over stock-chasing are pointed out and some of the forms employed in this work are taken up in detail. Mr. Basset winds up this part with some figures to show an actual saving in the non-productive labor at one plant.

Recognition of his services, long due the engineer, is beginning to be given—and the engineer is beginning to perceive that seeking for this recognition is a part of his duty. The engineer of discernment will see that the F. A. E. S. (Federated American Engineering Societies) will advance the interests of the individual engineer by causing the advancement of the profession, through a greater recognition, by the public, of the engineer and allied technologist and by increasing the solidarity and raising the standards of these professions. Facts about the F. A. E. S. are told on page 220. There is also an editorial on page 234.

Conditions abroad are described on pages 238 to 241 where you will find articles on England, Czecho-Slovakia and Germany. Our London correspondent also includes a few words on Scandinavia. You will want to know what the association of German Tool Manufacturers thinks of the future for German machine tools. As for Czecho-Slovakia her possibilities are almost limitless for her resources make her practically self supporting and she has plenty of skilled and thrifty workmen.

Packing For Export

COMPLAINTS from across the water are piling up against the careless packing of our export machinery.

One of the largest English machine-tool dealers has been compelled to send all of the American machines received to the shops to be thoroughly cleaned and overhauled before they are put on sale.

One lot of automatic machines was so deeply pitted with rust as to be only available as second-hand equipment.

Another large French dealer follows the same course as the English firm, in order to preserve the reputation of the machines he handles.

Not only are very many of the machines which cross the water badly rusted, but in numerous cases the boxing is so poor that parts, or even beds, are broken in transit.

The American exporter must remember that owing to freight congestion and labor troubles, his machines are liable to have to lie on the docks, exposed to all kinds of weather for days, weeks, or even months.

The exporter should also keep in mind the fact that the present less efficient or more careless labor will soon wreck anything but the very best boxes or crates.

Parts broken on machines sent to England mean from three to six months additional delay in delivery of machines on order. This, added to the original delay in filling an order, may easily amount to from six months to a year.

On machines delayed in this manner, who can blame the foreign buyer if he in the meantime obtains machines elsewhere, if he can, and cancels his American order?

Even if he is compelled by circumstances to accept the American machines after all this delay, due to the exporter's pure ignorance or indifference, he will be in no mood to repeat his experience if he can possibly place his orders with other concerns.

Machines to be exported should be thoroughly "slushed" with some good, easily removed, protective which will not run off when the freight is exposed to the hot sun. Following this the machine should be covered with waterproof paper or cloth, and the box made to withstand the roughest handling.

One firm noted for its careful packing, lines its boxes with tin in addition to the use of slush and waterproof covering.

Each one who values his export business should at once see to it that HIS shipments go out boxed in a foolproof and weatherproof manner.

Thos Viall

Editor

EDITORIALS

The F. A. E. S.

THE Joint Conference Committee (of the four founder engineering societies) is at present handling the business of the F. A. E. S. (Federated American Engineering Societies). We quote from a recent paper of this committee: "The Joint Conference Committee is unqualifiedly of the opinion that an opportunity has been created for bringing about a solidarity of the engineering and allied technical professions that has never heretofore been available and that the success of the movement will depend upon the whole-hearted support of each American engineer and of each technologist, who, if determined that this movement shall succeed, will obviously not bother with the details or the form of organization, in his effort to secure the end desired."

There is no doubt that "an opportunity has been created for bringing about a solidarity of the engineering and allied technical professions that has never heretofore been available." As previously explained in these pages, the F. A. E. S. is not the outcome of any individual's ideas, or of any one society's ideals, but is the result from a positive need, made evident during a period of several years—a need felt by individuals and societies alike. Engineering council was a step in the right direction but it has been by no means comprehensive enough.

The individual societies have been convinced of the need for concerted action, they have chosen their delegates, the conference has been held and the organization brought about—the opportunity has been created.

The second part of the quotation is also true—"that the success of the movement will depend upon the wholehearted support of each American Engineer and each technologist." The societies concerned are now receiving reports from their delegates to the organizing conference, examining the work done at Washington and putting to a vote the question of applying for admission to the F. A. E. S.

Among the societies which have taken favorable action are the American Society of Mechanical Engineers, the American Institute of Chemical Engineers and the American Institute of Electrical Engineers.

This brings us up to the last part of the quotation " . . . . who, if determined that this movement shall succeed will obviously not bother with the details or the form of organization in his effort to secure the end desired." An amount of inquisitiveness on the part of those who sent their delegates to the conference is pardonable. It is especially pardonable in the engineer, who is, by the nature of his profession, taught to see for himself that which he is going into. For the benefit of engineers at large we are printing on page 220 of this issue, an article entitled "Facts About the F. A. E. S." There are explained the choice of its name, the basis of representation when both state and local organizations exist, operation, and prospective income and expenditures. These are the subjects which, of course, cause most discussion and require most explanation.

Let us not "bother" too much, however, with the details. The delegates did that part of the work by passing their judgment as unanimously approving the constitution and by-laws which are now being presented to the societies; they did the necessary threshing out of details and made any required adjustments of form. It was no meager task which they faced, but they saw it through in a most conscientious way, and with an insistence concerning detail that afforded complete understanding and satisfaction. Such a spirit of "wanting to be shown" was highly commendable at the conference, where all were together and questions could be settled without loss of time. It is to be hoped that it was productive of a dissemmination of information on essential points sufficient to satisfy the societies.

To be too insistent upon detail would be like holding to a small tolerance the dimensions of a part to fit the air. Let us not lose sight of the main issue in quibbling.

L. C. M.

The Need for Frequent Testing of Gages

THE careful and periodical inspection of all shop measuring tools and instruments cannot be too strongly urged.

Most workmen are apt to take it for granted that their "mikes" are right, provided they bear the name of their favorite maker.

Snap gages kept for certain jobs are also usually taken at face value, regardless of their age.

Special measuring machines and precision gage blocks are used year after year and still thought to be correct.

Some shops have all measuring tools carefully inspected at frequent intervals, but how many of these are careful enough regarding their master sets?

The inspection reports of one great company, using a number of sets of precision master blocks, show an average wear of 0.002 in. per set in a five-year period.

Another firm's report shows a wear equal to this, on a frequently used set of six blocks, in three years.

The article on page 209 of this issue reveals some rather startling figures regarding micrometers.

Approximately 63 per cent out of hundreds of micrometers, tested in shops all over the country, were found to be incorrectly set at zero.

Compared with the workman's micrometers, those belonging to the employers showed almost twice as many incorrectly set ones.

A workman naturally takes better care of his own tools, but that is no reason for the employer not keeping his equipment in shape.

Many employers do not realize the poor condition of their gages—but they should—and should take steps to make and keep them correct.

In order to have accurate master reference gages, at least one set should be kept in a safe place, and used only to keep a check on other sets more frequently used.

E. V.

SHOP EQUIPMENT NEWS

-Edited By-
E. L. DUNN and S. A. HAND

SHOP EQUIPMENT • NEWS •
A weekly review of modern designs and • equipment •

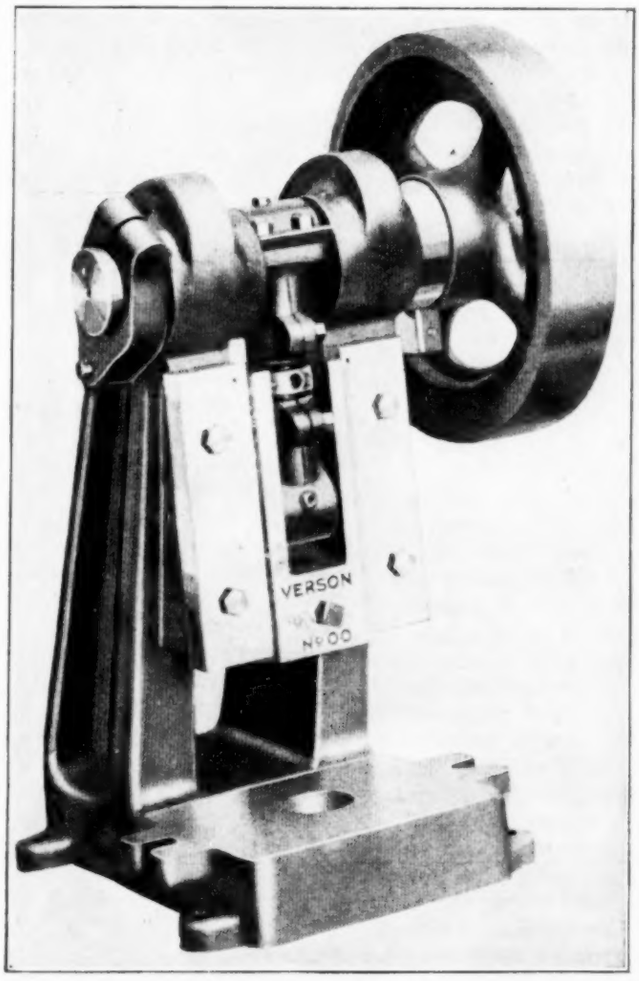
Descriptions of shop equipment in this section constitute editorial service for which there is no charge. To be eligible for presentation, the article must not have been on the market more than six months and must not have been advertised in this or any previous issue. Owing to the news character of these descriptions it will be impossible to submit them to the manufacturer for approval.

• CONDENSED • CLIPPING INDEX
A continuous record of modern designs • and equipment •

The Verson No. 00 Power Bench-Press

The La Salle Machine Works, 3013 South La Salle St., Chicago, Ill., is building the Verson No. 00 adjustable power press shown in the illustration. This machine is adapted for blanking, forming and other press operations and can handle such light work as is often done on a larger machine.

The clutch is made of tool steel and hardened. It is simple in construction and of the positive type. It is provided with an automatic safety device which disengages the clutch at each revolution of the press whether or not the treadle is released. If the press is to be used on a job where it is desired to have it repeat, the safety device can be thrown out by loosening one screw and it will then repeat as long as the treadle is pressed down. The machine is of the open-back type, and permits feeding the work either from right to left or from front to back. The press can be furnished with a table and legs if desired.



VERSON NO. 00 POWER BENCH-PRESS

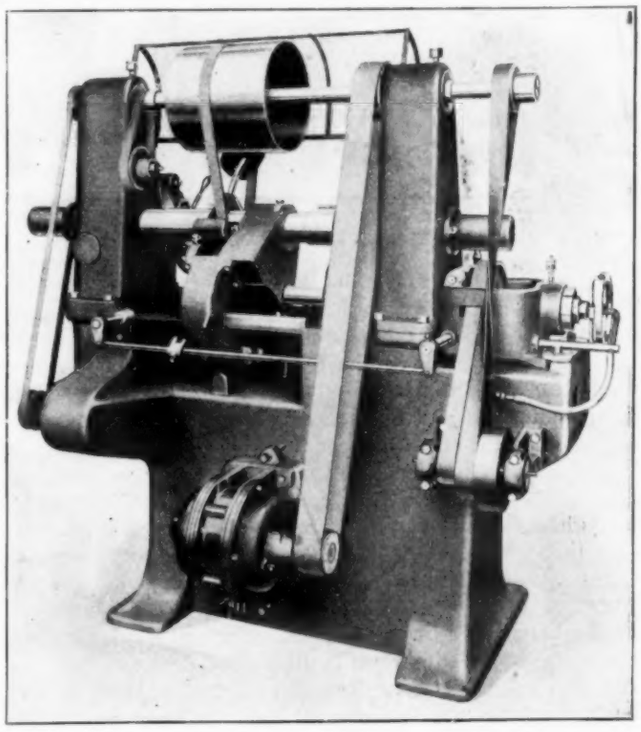
Specifications: Stroke of slide, $\frac{7}{8}$ in. Adjustment of slide, 1 in. Width of opening through back $3\frac{1}{4}$ in. Finished surface of bed, 7 x $5\frac{3}{4}$ in. Diameter of hole in bed $1\frac{7}{8}$ in. Diameter of shaft, 2 in. Flywheel, 10 in. diameter; face, 2 in.; speed 250 r.p.m.

Bryant Chucking Grinding Machine

The Bryant Chucking Grinder Co., Springfield, Vt., has recently brought out the grinding machine illustrated herewith.

The machine is self-contained, and is furnished in two types—a single-spindle machine for grinding holes only and a double-spindle machine for both hole- and face-grinding.

The illustration shows a rear view of the No. 15



BRYANT CHUCKING GRINDING-MACHINE

Specifications: Chuck range, 12 in. Grinding length, 9 in. Work spindle, 150 and 300 r.p.m. Wheel-slide travel per revolution of work, $\frac{1}{16}$ and $\frac{5}{16}$ in. Weight, net, 3,000 lb. Floor space, 36 x 84 in. Motor recommended, 3 hp. 1,720 r.p.m.

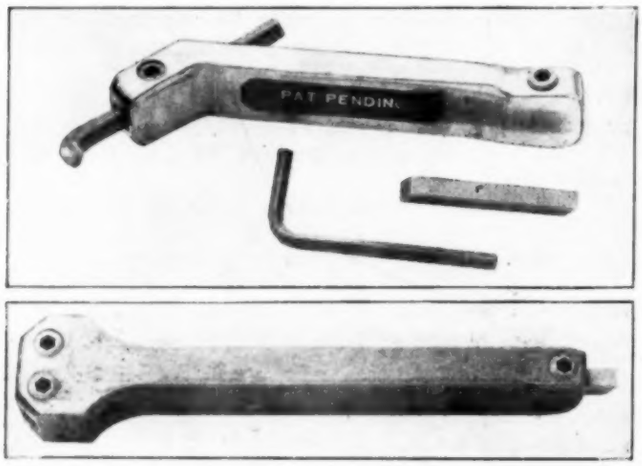
single-spindle machine with motor attached. When it is desired to drive the machine from a line shaft a countershaft with tight and loose pulleys is used.

The work spindle runs in adjustable bronze bearings, the front bearing being 3 in. and the rear bearing 2½ in. in diameter. Two speeds are provided for the work spindle and two traverse speeds for the wheel slide, instantly obtainable by a lever. A graduated plate indicates angular adjustment for grinding tapers up to 30 deg. included angle. The wheel-spindle drive shafts are mounted in ball bearings of inclosed type, requiring only occasional oiling. A pump and piping are arranged to carry coolant to the work through the spindle.

All pulleys and rotating members are dynamically balanced at the speed at which they are to run.

Rouillard Universal Toolholders

Toolholders of the types shown are being marketed by the Rouillard Tool Corp., 608 Chestnut St., Philadelphia, Pa. The offset holder is intended principally for lathe work. It may be used for holding a boring tool as shown in the illustration; for holding tools for either right or left hand facing, or a tool for ordinary turning —hence it is known as the 4 in 1. When used for the opposite hand to that shown, the holder is turned up-



ROUILLARD UNIVERSAL TOOLHOLDERS

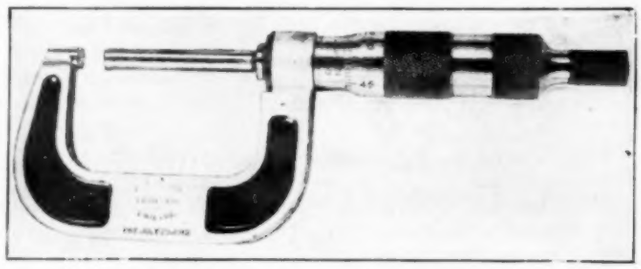
side down, setscrews for holding the cutting tool being provided on the bottom as well as on the top. The opening for the cutters in the offset portion of the holder is parallel with the body of the holder, but the opening in the opposite end has a slant of 8 deg. to provide a slight rake for turning.

The straight holder shown is designed for shaping and planing work and can be used for straight or right-hand or left-hand work. The holes for the cutters in both holders besides being reamed are partially squared with a broach so that they will hold square, round or octagon stock equally well. The setscrews are of the hollow-head type with fine pitch S. A. E. threads, but square-headed screws can be used if preferred. In addition to the regular line of cutters for turning and boring, special attachments such as knurling and gooseneck turning and threading tools, are furnished when required. The toolholders are drop-forged and pack-hardened and are made in seven sizes; the smallest, No. 10, is ⅜ x ⅜ x 4½ in.; the largest, No. 6, is 1 x 1¾ x 13 in.

Blush Multiple Micrometer

The micrometer illustrated herewith is a product of the A. T. Blush Tool Co., 1145 West 11th St., Erie, Pa., and can be used to measure from 0 to 2 in. without any attachments.

The spindle has a screw of 20 threads per in. while a separate screw of 40 threads per in. is used for traversing the thimble. It will thus be seen that the spindle travels twice as fast as the thimble.



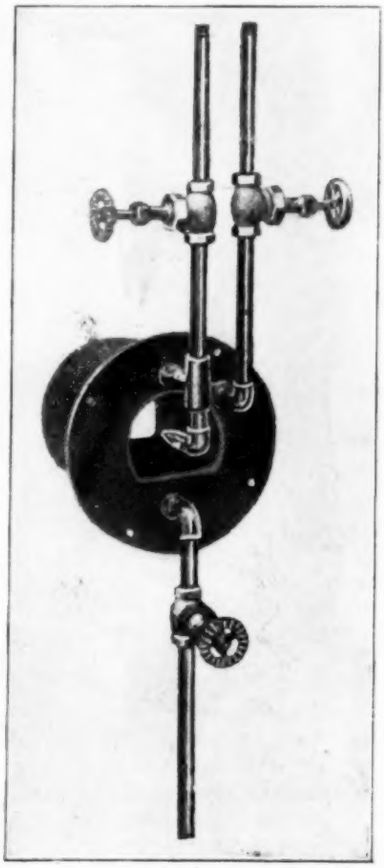
BLUSH MULTIPLE MICROMETER

It is claimed that the graduations are very easy to read and that a simple adjustment is provided to take up the wear on both the anvil and spindle.

The Berg Burner

The Berg Burner is designed to burn oxy-hydrocarbon-gas that it automatically produces from oil and water. Super-heated steam is generated by the burner and combined with the oil flow as it leaves the nozzle. The hydrogen of the steam unites with the hydrogen and carbon of the oil, while the oxygen set free in a superheated state is said to create perfect combustion when the torch is ignited.

The burner may be started in operation with cold water by burning oil in a preheating dish provided for that purpose, the procedure being similar to starting an ordinary blow-torch, but an independent source of steam supply is preferable. By regulating the supply of oil and steam a flame almost white is created that is said to burn some distance from the point of the nozzle without smoke, noise or vibration. The steam is super-heated in the annular chamber surrounding the nozzle. The upper right-hand inlet pipe supplies either steam or water as the case may be and extends between the walls of the chamber to the rear end. The oil



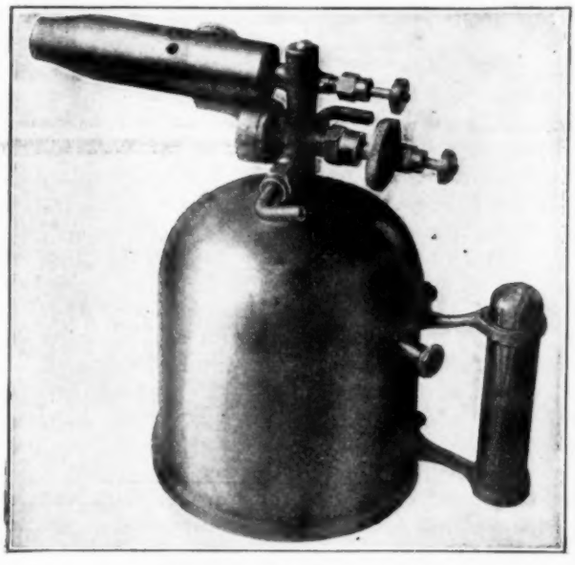
THE BERG BURNER

pipe, which carries the nozzle is connected to the steam chamber by a close nipple and the steam while flowing along the full length of the chamber becomes superheated before uniting with the oil and leaving the nozzle. The correct mixture of oil and steam, also the proper degree of heat is obtained by manipulating the two needle valves at the top, the lower valve being provided merely as a blow-off. The burner will operate in any position and is designed to consume either the cheapest distillates or refined oils but not gasoline or kindred products. The burner is manufactured by the Berg Burner Co., Inc., 100 Emerson Place, Brooklyn, N. Y.

Pumpless Blow Torch

The Pumpless Blow Torch Co., Phipps Power Building, Pittsburgh, Pa., is making the blow torch illustrated herewith. The torch does not require preliminary pumping and pre-heating. The fuel used is butane, obtained from natural gas and reduced by pressure to a liquid.

The liquid volatilizes in the fuel chamber of the torch, filling the space between the surface of the liquid and the top of the chamber with gas. Two ducts lead from



PUMPLESS BLOW TORCH

the fuel chamber to the burner: one from the top and one from the bottom. To start the torch, the valve in the upper duct is opened, allowing the gas to flow directly to the burner where, upon ignition, it burns with a clear steady blue flame at a temperature of 2,240 deg. F. After burning for a minute or two the burner becomes hot, the valve in the lower duct is then opened and the upper one closed, allowing the liquid fuel to flow to the burner where it is volatized by the heat.

It is claimed that the torch has been tested over a wide range of temperatures, and will work as readily in zero weather as in mid-summer.

The torch is made in one- and two-quart sizes. The one-quart size will burn over three hours on one filling.

Erratum—Merey Stampograph

In the issue of July 15, page 139, we published a description of the "Mery" Stampograph. This machine is manufactured by Julius Merey, 2842 North Maplewood Ave., Chicago, Ill. We regret our error in spelling the maker's name.

"Stazon" Anti-Rust Compound

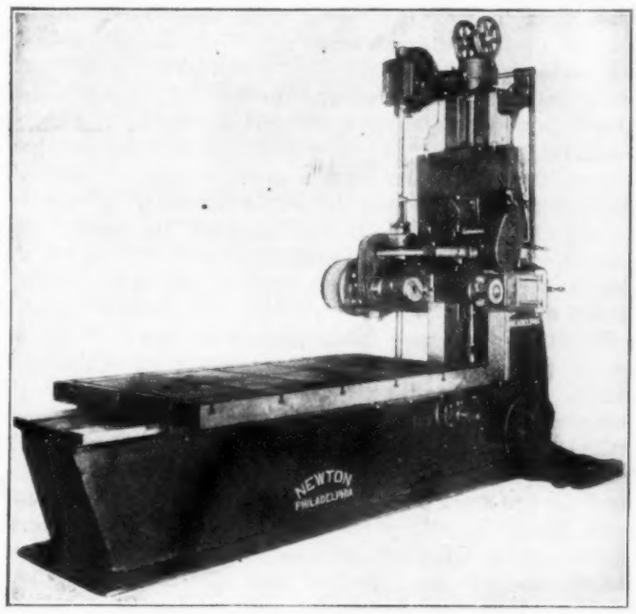
The Conversion Products Corporation, 149 Broadway, New York City, has placed on the market an anti-rust compound known as "Stazon." It is an inert mineral compound having about the consistency of No. 5 cup grease. The base is a petroleum derivative.

It can be rubbed or brushed on the bright parts of machinery destined for storage or shipment and is claimed to be proof against acid fumes and moisture. "Stazon" does not begin to run until 200 deg. F. has been exceeded and contains no free acid. It is not sticky and is readily removed by ordinary wiping cloths. It also has fair lubricating qualities.

Newton Special Milling Machine

The machine shown in the accompanying illustration is a late addition to the line of the Newton Machine Tool Co., Inc., Twenty-third and Vine Sts., Philadelphia, Pa., and was designed for milling slots in motor rotors.

The spindle is driven by a phosphor-bronze worm-



NEWTON SPECIAL MILLING MACHINE

Specifications: Feed of spindle saddle, 24 in. Maximum distance center of spindle to top of table, 24 in. Side adjustment of spindle, 2 in. Center of spindle to face of upright, 12 in. Work table, 54 x 96 in.

wheel and hardened steel worm, the worm having roller thrust-bearings and running in a bath of oil. The spindle is hollow to accommodate a draw-in-rod and the spindle nose has a Morse taper hole and a face keyway.

The spindle saddle is counterweighted and has power rapid traverse in both directions, a safety feed stop being provided so that the downward rapid traverse cannot be carelessly engaged to the injury of cutters or work. The feed motion is provided with automatic stops and the arrangement is such that when the feed is thrown out the spindle rotation stops. The table has a hand-operated movement of 24 in. and is provided with both longitudinal and cross T-slots. All gears are either inclosed or covered by standard guards making the machine absolutely safe for the operator.

The Ambitious Industrial Plans of Czecho-Slovakia

By JOHN B. WOODS

OUT of the mist which buries the political nightmare of the eastern European countries come now and again dispatches dealing with industrial conditions. And these news items indicate that at least one country in that great and, to Americans, little known region is now getting started upon a widespread and very farsighted program of industrial development. The new republic of Czecho-Slovakia, comprising the three important states of Bohemia, Moravia and Slovakia as well as a slice of Carpathian Russia and also a very important slice of Silesia, is a very hotbed of industrial possibilities. If present plans carry through, during the next fifty years the big production of iron and steel goods which gave the region its pre-war prestige and formed the backbone of Austrian resistance during the struggle, will be dwarfed by future development.

It is stated by patriotic citizens of the new war-born Republic that their country is almost ideal in its balance of agricultural and industrial characteristics; the western and northern portions being industrial, while the southern areas are fertile and well handled. Also as a matter of fact, the forest wealth of the country is immense; a forest map indicates at a glance that half of the entire territory is under timber of various ages. And the feature of the whole situation that makes it read like a fairy tale is the fact that the Czechs and Slovaks have acquired a ready-made country, in which they were the silent partners until the fortunes of war turned the tables.

Of course they have much pioneering ahead of them, but it is not the kind of pioneering with which we Americans are familiar. Instead of barren wastes or new country peopled by hostile savages they find long settled regions with industries highly developed and transportation systems well established, although they must change some of their railroads so as to direct them upon cities which they hope to make important centers of commerce. Having their export point on the Danube instead of the Black or the Mediterranean they must go down and deepen its channel from Bratislava (Pressburg) to the Black Sea so as to accommodate seagoing craft. And like the other nations of the World War group they must reconstruct their fabric of commerce on a peace basis.

Being fortunate in coal they have been obliged to supply great quantities to their neighbors, thereby delaying some of their own plans for reconstruction. At present their greatest needs appear to be time enough to get their food production upon an exporting basis; credit to enable them to import raw materials and certain kinds of industrial equipment, and the assitance of financial and technical men to organize their new possibilities.

Production of Raw Materials

Briefly and roughly the mineral resources of the country in the past have centered in Bohemia and Moravia. Annual production of iron ore was about 2,200,000 metric tons. Because iron industry had attained such proportions as to require importation of ores, the mining people of the countries mentioned had long held properties in Norway and Sweden as well as in Bosnia. Something like a half million tons were imported yearly from these countries. Lead and silver, some gold, and even radium were extracted from the hills of old Bohemia before the war. Coal was mined in Bohemia and Moravia of quality suitable for coking, although the coke production was less than a fifth of the annual coal output from these regions, because the greater portion of the fifteen million tons taken out yearly was unsuitable for making coke. In southern Moravia and in Slovakia lignite is mined, and of the 26,000,000 metric tons produced yearly about a third has been exported in the past. Water power is plentiful and is to be developed under the present plans, with electric energy as the product.

Machine Industry

The foundry and machine-shop industry is highly developed in many parts of Bohemia and Moravia. In fact structural steel, railroad and marine equipment, mill supplies and power plants, have long been known throughout the world under the names of some of the old firms. There is a degree of interest in a perusal of the history of such a plant as that of the Witkowitz or Vitkovice Iron Works, founded in 1829 by Archduke Rudolf, Prince Archbishop of Olmütz, who brought in English workmen to handle the first puddling furnaces. Later the S. M. von Rothschild bankers bought the plant, enlarging it and adding many products to the humble beginnings. In 1873 the present association of metallurgical interests bought the plant with its supplementary holdings in foreign lands and continued to enlarge and improve until at the beginning of the war the iron and steel works, chemical plants and collieries employed thirty thousand men, and maintained schools, co-operative stores, hospitals and pension systems to an extent hardly surpassed outside of the German Empire. And Vitkovice was but one of several iron and steel centers.

Other Manufactures

Glassmaking, pottery and brick manufacture, leather working, wood-working, production of agricultural and machine tools, and the textile industry, all are important in the Republic, inherited from the states of the old Empire. And practically all of these highly developed industries were dependent in a measure upon imported raw materials and will be dependent in the future for the same classes of goods. In fact for a while, until the reorganization of facilities from war to peace basis they will require many kinds of machinery and equipment from foreign countres.

In the field of wood-working there already has been progress made in bringing capital and technical skill from America and Western Europe. A company has been formed to build and operate several large furniture factories. It is understood that the leading men in this enterprise are Americans of Czech nativity who have been successful as financiers and manufacturers in the land of their adoption. They expect to obtain considerable equipment of lumbering and furniture-making machinery in America. In general there is a great need of lumbering and wood-working machinery, for the pro-

duction of timber in that country is highly organized and for several generations has been carefully regulated. They have the timber, but their mills and factories have suffered from war-time pressure and require new equipment. In addition to general construction and to the production of agricultural tools and vehicles the wood using industries include toy making as an important member. The paper industry is widely developed, based naturally upon plentiful supplies of pulp wood and catering to a great publishing field in the nation.

Being by the very nature of things a manufacturing medium between raw materials from other countries and the world markets, and having in mind enormous developments of power sources for the future which will enlarge this industry and commerce the present governmental and business interests of the country are devoting much thought and effort to solving the problems of international trade. A plan which has been suggested to revive the glove making industry is of interest. It is based upon the principle that foreign capital shall be protected from fluctuations in the value of money. The foreign interests may be expected to deliver the raw materials in the country, to their agent, who can allot them to manufacturers for working into gloves. As the finished product is turned out it can be handled by the agent for export and sale. The payment for manufacture can be made to the factories in Czecho-Slovak crowns, based upon prices fixed in terms of some stable foreign currency. Thus, both parties will be protected and enabled to forecast profits without the gambling chance that now adheres to trade in central European money. If such schemes meet with widespread approval and support there appears to be no reason why they should not be adapted to other industries until such time as the new Republic finds itself on a stable exchange basis.

Skilled workers in many lines have been trained through long years of industry under the old regime, and certainly they constitute one of the most important resources of the Republic. The temper of her workers is indicated by the situation in the coal fields during the year 1919. In spite of the enormous quantities which were required for export to other states where the need was critical, and which naturally curtailed the progress of industrial reorganization in the country itself, there were no strikes or labor troubles in the coal regions during that year. Of course under the old regime labor was a commodity of no great cost, at least as compared to our American wage scales. And the consciousness of the skilled workman was an inherited thing; he followed in the steps of his father like as not and was known among his friends and by his immediate superiors as a specialist at some trade. To be the son of a blacksmith was to have fairly clear expectations of being yourself a blacksmith. However, with constantly expanding industries, the handing down of tradelore was not sufficient as a source of workmen and schools were established years ago for the purpose of teaching the trades as well as the arts. The leaders of the new government have been quick to the necessity of such institutions and have fostered them wisely. During the 1919-1920 school year there were about one hundred and twenty-seven thousand students enrolled and attending the arts and crafts and trades schools of the country, or slightly less than one per cent of the total population. Although war losses are severe and the nervous unrest is not entirely lacking in the ranks of labor, yet the better wages of today and the agencies working to supply skilled men certainly will keep the wheels turning in this most fortunate of central European lands.

The coal owning countries of the continent always have had the big advantage of relatively cheaper power, as of course is the case the world over. And this wealth, which has brought Bohemia and Moravia to the fore as industrial centers, is to be expanded and enlarged in the future by a great plan of electric power development. This program, as announced by the Government as long ago as February, comprehends the use of both coal and water as sources of electric energy. The available water has been estimated at 800,000 hp., and it is expected that the harnessing of these streams will result in a saving of fuel equivalent to 6,000,000 tons of coal, or about 15 per cent of the yearly production. It is calculated that the construction of necessary plants and improvements will cost in the neighborhood of two billion of crowns, and that the work will be extended over a period of fifty years before the entire scheme is carried out. At the same time steam generating plants are to be built in the neighborhood of coal and lignite mines to link up with the country wide system. There will be nine large steam using stations, costing five hundred million crowns. It is planned to complete these plants within the next twenty years.. Primary and secondary transmission lines will cost a billion crowns and will cover the entire land in a network of high tension lines and distributing systems. Thus the whole proposition entails the expenditure of three billion five hundred million crowns.

The manner of financing these enterprises is unique. The State is to share with the Provinces the task of installing hydro-electric plants on the large rivers, while the steam installations will be handled by corporations of semi-public nature in which the State, the provinces, smaller political divisions of the country and private parties, will be allowed to hold stock. The National Assembly has voted an appropriation of seventy-five million crowns as a beginning of the general scheme, while several counties have combined to purchase a lignite mine in southern Bohemia with a view to starting construction of the first of the steam using generating plants.

Aside from the business possibilities which well may come from the inauguration of such wide-spread engineering construction, in a country which still has its difficulties on account of lack of raw materials and machinery, there is an added potential field for business relations in the fact that one of the intended steps is the electrification of railroads. American railway equipment made very favorable progress in the electrical field during the war, and more recently has been successful on a large scale in other parts of the world. The extent of our actual participation in the industrial advancement of Czecho-Slovakia depends of course upon many factors, some of which are unfavorable at the present time. However, there is a bond of friendly feeling extending across the ocean, and of course a great many Americans of Czecho-Slovak origin are engaged in forwarding the development of that Republic.

Erratum

Our attention has been called to an error which appeared in our issue of May 27, page 1147, Vol. 52. The number of cubic feet in the tractor crate should be 178 and not 278.

Business Conditions in England

FROM OUR LONDON CORRESPONDENT

LONDON, June 28, 1920.

THE outlook in the machine-tool world continues dull, and the absence of prospective business together with the certainty of heavy taxation, combined possibly with the advent of fine weather and the call of the sea and the countryside, are having a somewhat enervating effect. This has been felt mostly by merchants. The shops remain full of work, for arrears of orders have not yet been wiped out. A number of machines being manufactured are to be exhibited at Olympia, W., in the autumn, but one or two firms at any rate are still doubtful whether they will be represented. The writer has heard of no definite decisions to withdraw, but is aware that this is in contemplation. Probably all the firms taking space will conclude that it will be well to proceed.

The claim for an increase in weekly wages of 23s. 6d. is being made formally, and the present signs are that it will be resisted. It is of course a step on the road to the present ideal of £6 10s. a week for a 44-hour week. The inquiry is almost due. In the Midlands the employing section seem decided to secure payment by results before agreeing to any further concessions. It is rather singular that in this district a provisional agreement, nothing more, has been reached on this subject between the employers' federation and the officials of the chief trade union concerned, for the general introduction of the system into iron foundries. The molders have been among the most determined opponents of payment by results. Some time ago the unions of unskilled labor concerned gave their agreement to the working of the scheme in engineering shops, but so far this has not applied to skilled workers. The new Alamgamated Engineering Union becomes operative this week and at the same time the new National Union of Foundry Workers, also an amalgamation of existing societies, takes the field.

UNEMPLOYMENT NOTED IN MANY INDUSTRIES

Some measure of unemployment has been noted in the engineering industry, abnormal unemployment having been reported in connection with fitters and turners in the Lancashire districts; the same also applies to areas as wide apart as the Newcastle district and the south of England. Slackness, too, has been reported in connection with rubber, soap and tanning, and the tobacco industry has been noticed to be slumping for some time; indeed firms have refused to arbitrate on the question of increase of wages, stating plainly that they are not doing the business they did. The retail trades have been falling away for some time, and this applies particularly to the textiles of Bradford, where by the way on the producing side further wage increases are demanded. The unemployment noticeable remains somewhat closely confined to the semi-skilled and unskilled workers. Most of the skilled trades are at present undermanned and this condition, as applied to machine shops, shows itself particularly in ironfounding, while the general condition of the building trades is notorious.

Views vary somewhat in the industrial fight as to the exact effect of comparatively recent wage increases and reductions of working hours in the engineering industry with relation to foreign trade and competition. But doubts on both sides are growing, and a non-government committee of investigation is in process of formation "to inquire into the economic relation of hours to work and the methods of manufacture in this and foreign countries"; as usual, representatives both of employers and employed form the committee.

EMPLOYERS STARTING A UNION FOR EMPLOYEES

In an attempt to force the bonus system the pianoforte manufacturers are themselves forming a new trade union for workmen, and will re-open their shops and thus end the strike, if the workpeople agree to become members of this new trade union, or to accept the system as named.

At the last weekly meeting of the London iron and steel exchange a fair attendance was officially recorded but "business was practically at a standstill." Cancellations, moderate in quantity, were noted. On the same day the Birmingham motor market was reported as of unrelieved weakness, though this was not quite literally true. More recently Sheffield recorded a drop in new business but big arrears of orders on the book. Scarcity of foundry irons, uncertain supplies of fuel, and insufficient rolling facilities have again been mentioned; also difficulties of settlement of some continental accounts and cancellations owing to the impossibility of firm quotations. All this has a relation to the future. Work in hand is more than ample. The foundries can produce at no higher rate and the writer knows of some with orders that will keep them fully occupied for two years. As to steel plates, one firm is reported as accepting orders for 1924 at current rates. Locomotive builders in the Newcastle and Glasgow districts have been held up for want of materials, and some Scottish shipbuilders appear to think that, if the decline has not set in, the top has now been reached.

The amount of the advances to British exporters under the government credit scheme was at a recent date £2,824,284.

SCANDINAVIAN TRADE CONDITIONS REPORTED FLAT

Trade visitors to Scandinavian countries have returned with the report that conditions there are flat, and that in their view the countries concerned are at present well stocked with American, English and German tools.

Sheffield will not welcome the advent of high-speed steel from France. The samples thus far submitted seem to have satisfactorily passed such tests as were applied. The material itself is of somewhat lower price than British-produced high-speed steel.

Another steel for machining purposes has just been introduced by the Woodward-Weddell Steel and Engineering Co., Birmingham, to take a place between the ordinary carbon steel and best high-speed steel. It is the product of the electric furnace and details of composition are not at present available. Rather mysteriously the steel is said to contain two alloys used in connection with heat-treatment. The price is expected to be about 50 per cent in advance of that of carbon steel, the permissible cutting speed showing an increase of 25 per cent with an increase in the cut of about 50 per cent. The steel will stand up to temperatures of 600 to 700 deg. C. and is hardened by plunging in boiling water. Apart from its use in making cutting tools, the steel can be machined and thus is suggested for ball bearing races.

WELDING FIGURES

Some figures are available respecting output obtained from electric resistance welders manufactured by the A. I. Manufacturing Co., Bradford. Thus, for drums, a special longitudinal welder is available, the upper electrode, in the form of a roller, being carried by a horizontal arm, which, rack-driven, moves over the metal to be welded, the speed being 5 ft. to 10 ft. 6 in. a minute, according to the thickness of metal. Another machine is for circumferential seam welding. For a daily production of about 2,000 drums, each 24 in. long by 14 in. in diameter by 20 S.W.G. (0.036 in.), an average plant contains about five longitudinal welders to nine circumferential machines, with one spot welder for the handles, each machine taking about 10 kw. Drums 16 in. long by 12 in. in diameter by 22 S.W.G. (0.028 in.) can be seam-welded in one-fifth of a minute, the ends being welded in less than a minute and the handles spot-welded on at the rate of eighty to the hour. The machines made by the firm are for single-phase alternating current and include a transformer, made as a

unit. No current is allowed to pass through pivots; this old lesson is apparently not always remembered in the design of electric-heating apparatus.

A Fatigue Research Board

Arising out of work in connection with the health of munition makers, etc., Great Britain has a special Industrial Fatigue Research Board which was appointed about the middle of 1918 by the Department of Scientific and Industrial Research jointly with the Medical Research Committee, now the Medical Research Council. The first annual report has been published. It relates to the period down to the end of March last, but as regards results effected it is not particularly illuminative, several detailed reports having already been issued. One rather interesting conclusion is mentioned, though it is admitted that data available are slender and apply apparently only to women workers, namely that accidents are "largely due to a special susceptibility inherent in the personality of the individual, so that the bulk of accidents occur amongst a limited group of individuals." This investigation is to be continued so as to include men and boys. Owing to the impossibility of eliminating will, a psychological test for fatigue was not successfully determined. A report on fatigue and efficiency in the iron and steel industry awaits further statistical treatment. Among investigations being continued is one to devise vocational tests for different types of engineering work. As regards the causes of accidents, two large engineering firsm have agreed to place their accident records at the disposal of the board if required. An attempt is being made to standardize records. Thus, standard forms dealing with output, lost time, accidents, and labor turnover have been submitted for the criticism of government departments, trade unions and employers, and it is expected that before long definite recommendations will be made. The board proposes that as the scope of the work is enlarged, industries should be invited to contribute to the cost of given investigations.

Engineering Exhibitions

As an adjunct to the Great Victory Exhibition—to quote part of its title—being held at the Crystal Palace, Sydenham, S. E., an engineering exhibition has been organized, but so far in attracting the engineer has proved no sort of competitor, even to the Handel Festival held in the same building. The engineering exhibition concerns itself more or less with gas, electricity and oil; it is largely under the floor of the main building and spreads itself out toward one of the palace approaches, but the section given up to oil and its use in engines, furnaces, and so on, is in a separate building, well away from the rest and, in truth, somewhat difficult to find. On three or four stands the engineer will find something to hold his attention, these stands being mainly those associated with the Armstrong-Whitworth, Beardmore, and Vickers combinations. In each case the named firm has associated with it a series of more or less subsidiary companies, so that the Vickers combination, for example, includes also S. E. Saunders, Lt., East Cowes, builder of motor launches; Centrifugal Separators, Ltd., London, S.W., its products being indicated by the title; Ioco Rubber Co., Glasgow; T. Cooke & Sons, Ltd., York, maker of optical, astronomical and surveying instruments; the British Refrigerating Co., London, S.W.; Robert Boby, Ltd., Bury St. Edmunds, maker of agricultural machinery; Taylor Bros., Leeds, maker of railway wheels and axles; Variable Speed Gear, Ltd., London, S.W., maker of the Janny gear; and Petters, Ltd., and Vickers-Petters, Ltd., Yeovil, maker of semi-Diesel crude oil engines, etc. The other firms associated with Vickers do not seem to be showing. The Vickers exhibits, in fact, range from wooden toys to grooved hardened nickel chrome steel rolls, and include a number of engineers' small tools.

Similarly, Beardsmore & Co. displays models of airships, locomotives and war vessels, together with railway wheels, axles, drop forgings, rolled-steel disk wheel centers, and a valveless two-cycle engine of 320 b.h.p., using crude oil, and to be fitted to the Terra Nova for the next Antarctic expedition.

The Armstrong-Whitworth stand covers more than 2,000 sq.ft. and includes two machine tools; namely, a small surface grinding machine for work, 24 x 6½ x 9½ in., and a vertical milling machine with 2½-in. spindle. Forgings include a four-throw crankshaft weighing 3¼ tons, and a marine thrust shaft weighing nearly 7 tons. A special collection of drop stampings of high-tension alloy steels is noteworthy, the samples being particularly clean, the collection including crankshafts, back and front axles for automobiles, and some locomotive details. A new engine to be made in three sizes—namely, 3 hp., 5 hp. and 10 hp.—is on show in the smallest size. It is intended to use oil, starting with petrol, or will employ gas. The gas interests are making a good display, or will be soon as the stands are complete, but the only electric laundry installation is of American origin.

Situation of the German Machine-Tool Industry

By C. A. Heise

At the recent general meeting of the Association of German Machine Tool Manufacturers it was stated that the industry was seriously affected during the past year by the high cost of raw materials, strikes and incessant wage claims and but for the enormous expansion of the export trade the balance sheets of most concerns would have shown a deficit. This tremendous increase in export was, however, largely due to the enormous depreciation of the German currency which reached its lowest stand in April this year. Concurrent with the improvement in the German exchange since last April a steady falling off in foreign orders has been noticeable and it is feared that with a further improvement in the exchange, export may eventually come to a standstill altogether. In view of the possibility of this event and considering further the decreased demands of the home market, the report continues, the future aspect of the industry was not very encouraging, though the hope was expressed that because of the keen demand for machine tools in the world's markets, the German industry will sooner or later be once more in a position to take its full share in the world's supply of machine tools.

Device For Transferring Centers on Flat and Round Stock

By E. Lytton Brooks

With reference to the device for transferring centers, illustrated on page 630, vol. 52, of the *American Machinist*, by Roy V. Terry, I used a similar tool ten years ago.

If I remember rightly I purchased it from Messrs. Buck & Hickman, of Whitechapel Road, London. This tool in addition to transferring centers on flat stock, would admit of round stock and center it quite accurately.

The pump, or spring, center in the base of the tool was located in the center of a V-block, but was integral with the base. The V-block was removable, being slipped over the spring center and set up to a stop on the base. Different sizes of V-blocks could be inserted to cope with varying sizes of round stock. The V-blocks themselves had wide faces and were accurately finished to insure the flat stock laying properly. The tool otherwise closely followed the construction given in the sketch by Mr. Terry.

Will Resumption of Trade With Russia Mean Clean-Shaven Bolsheviks?

According to a dispatch to the American Cutlery Bureau of Information, stocks of American safety razors are running low in Russia. The small quantities that have been received have gone mostly to Siberian Russia, where allied influence is strong. This would seem to indicate that the Bolsheviks are not persistent self-shavers. Before the war Russia used to buy many American safety razors every year. These were in part shipped from the United States, but many razors reaching the Russian market came either by way of Germany, France or England. Many of the safety razors sold in Russia as American were really infringements of American patents introduced in Russia by various dealers. The same was the case with blades. As the market has been left practically unsupplied with American goods it is expected that the resumption of trading connections with Russia, now contemplated, will bring a considerable demand for American safety razors.

Peck Spring Co. To Enlarge Plant

With a new one story addition being built that covers 50 ft. of ground and fully double the size of the other section of the factory, the Peck Spring Manufacturing Co. will be in a position to handle the large business and constantly increasing number of orders coming in with greater convenience. At the present time the factory employs 55 hands and was compelled to enlarge the place because of rapid growth of the business. The new section will probably employ 20 hands and is expected to be completed within a month. All that remains to be finished is the roof. Machines have been ordered and will arrive any day to be installed and made ready for operation.

Railroads Going Easy

Railroads are holding back from buying tools, because most of them are short of money. Keen observers, however, do not think there will be any large orders placed until the rate advances are declared. The Norfolk & Western recently bought the larger part of machine equipment it required for early in June, spending close to $200,000. The Chesapeake & Ohio has also bought sparingly within ten days, probably as a feeler for additional purchases.

Coffey Family 'smiths 110 Years for Pratt & Whitney

On July 15 Jeremiah H. Coffey celebrated his fifty-third anniversary as blacksmith for the Pratt & Whitney Co., Hartford, Conn.

This was an event of dual importance, for it marked the completion of 110 years of blacksmithing for this company on the part of the Coffey family. Two sons, Thomas P. and John H. Coffey, share this honor with their father. Another son, Joseph, had served 19 years up to the time of his death last year.

Colleges and the Metric System

By Dr. Alex. C. Humphreys,
President, Stevens Institute of Technology

I feel that college men who have had no experience outside of the college and laboratory, perhaps do not appreciate the situation regarding matters of weight and measurement. It is the manufacturers who come up against the real tests. Having had wide experience as an engineer, manager of industrial plants and as a consulting engineer, I feel that I am competent to look upon the practical side and my opinion is without qualification that a compulsory law in favor of the metric system will be a *fatal mistake* and would place upon the industrial interests of the United States a tremendously heavy and unnecessary burden which would at this time, in view of foreign competition, be particularly inexpedient. It would involve the expenditure of millions and millions of dollars and instead of helping us with regard to exports, it would be hurtful.

To representatives of educational associations and institutions, who may have been led into an endorsement of the metric program, I would say that while naturally appealing to the workers in the laboratory as I am in a position to appreciate, I feel sure that to make a metric law compulsory would be a *great misfortune* to this country.

English Cutlery Trades To Adopt American Manufacturing Methods

A provisional committee appointed by the British Cutlery Trade Research Association recommends the employment of machinery in the cutlery trades. After having proclaimed for many years the superiority of handmade razors and shears, the English cutlery industry now sees itself compelled to withdraw from this position and take up the manufacture of cutlery upon the methods employed generally in the United States. It is admitted, says the report, that machinery is most necessary in the grinding stage, and the committee adds that it has taken up the problem with leading American experts. It seems that it will be difficult to secure the necessary machinery in England and steps have been taken, either to encourage their manufacture by an English machine-tool concern, or to import machinery from the United States. The new machinery will be employed principally in the manufacture of table knives, razors, pocket knives and scissors, but it is expected that machine production finally will be extended over the whole field of cutlery production in England. English cutlery, therefore, will abandon finally the production by hand.

Changes in Johansson Organization

Harry A. Raseley has resigned as sales manager of C. E. Johansson, Inc., Poughkeepsie, N. Y., to become export sales manager for the Nordyke Marmon Co. Before joining the Johansson organization, he represented the General Motors Corporation in the export field for a number of years.

Lawrence G. Spealman, who has been a representative for the C. E. Johansson, Inc., in Michigan for the past year and a half, comes to Poughkeepsie as sales manager for this company. He has had years of practical experience as an expert toolmaker and production engineer with such concerns as the National Cash Register Co., Buick Motor Car Co. and Dayton Engineering Laboratories Co.

The Michigan territory is to be taken over by John K. Murray, at present a member of the sales organization in Poughkeepsie, who will have his headquarters in Detroit. Mr. Murray is an old Michigan man, having previously been connected with several automotive industries in his new territory.

"A smile oils life's bearings."—*Forbes Magazine* (N. Y.).

LD'S INDUSTRIAL FORGE
News Editor

The Cincinnati Strike Situation

Strikers Gradually Returning to Work—Open Shop Gains in Favor—Judge Hickenlooper Renders Important Decision on Big Question

The machinists' strike in Cincinnati continues to drag beyond the tenth week with indications that the men are growing sick of it and only held from wholesale desertion by the efforts of their leaders. As it is, the number of strikers is constantly reducing and shops which only two weeks ago were practically closed down are now running with as much as half of their normal force. This does not apply to all, since a few shops are still practically closed, while others have almost 100 per cent of their men.

However, the average of the shops throughout the city may be considered as running with a force approaching 50 per cent of normal. This is outside of those plants located in what is termed the Oakley colony, which was never badly affected by the strike. There, all shops are now running with their full complement of mechanics. Picketing is increasing as the men begin to sense the chance of failure of the strike. This has led to court action by the employers seeking protective injunctions, and has resulted in a remarkable decision by Judge Hickenlooper of the Superior Court, which decision may have a momentous result in future strikes in Cincinnati and elsewhere.

The Non-Union Agreement

Many of the employers lately determined to run on a strictly non-union shop basis, and have posted notices to that effect. Many have re-employed only those returning employees who sign the non-union agreement. This agreement was drawn up by Dudley Taylor, a Chicago attorney, and was used by many of the members of the National Metal Trades Council, with which most of the manufacturers are affiliated. Following the announcement by the unions last spring of their intention to unionize all non-union shops, the employers arranged to have their loyal employees sign the non-union agreement. This agreement provided that they should not join any union, nor have any dealings nor communications with the officers or agents of any labor union, while remaining in the service of the employing firm.

Later, union pickets sought to induce these non-union employees to join the union and quit work, and this immediately brought about injunction proceedings by nearly a score of employers who wished to prevent interference by the union with their contractural relations with their employees. Accompanying the petitions were affidavits citing instances of threats and violence used by the strikers.

The two cases heard by Judge Hickenlooper were that of the O. J. Shafer Pattern Works against the Pattern Makers' League, and that of the John Douglas Co. against members of the Metal Polishers' Union. In rendering his decision he stated, as published in the Cincinnati *Enquirer* on July 13, that he upheld the agreement between the employers and employees, and decided that the union men have no right to seek to have these employees break that agreement. An injunction was granted preventing them from "initiating or commencing negotiations, dealings, communications or interviews with any employee who has signed the non-union agreement, either in relation to membership by said employee in the union, or in relation to said employee's employment."

Regarding the soliciting of others, the decision says: "As to those who have not signed or entered into the non-union agreement prohibiting such communications and interviews, such employees may be approached upon the subject of terminating their employment and thereafter joining the union."

Peaceful Persuasion Allowed

Judge Hickenlooper found in the case of the John Douglas Co. instances where the picketing of the company's shops "has been attended with frequent acts of violence, threats, abusive language and other coercive and intimidating acts, culminating in a brutal assault upon two of the employees on April 9 by four members of the defendant union." Therefore, the injunction granted is made perpetual against threats, violence, abusive language, coercion and intimidation, and the strikers are enjoined from accosting or from commencing interviews, communications, dealings or negotiations with any of the present employees relative to membership in the union or relative to their employment; from visiting the employees or their families at their homes for the purpose of opening such negotiations, either directly or indirectly.

"Peaceful persuasion of prospective employees" is permitted under the injunction, as also is the exhibition of a banner in front of the place by the striking unions. With respect to the Metal Polishers' Union, Judge Hickenlooper orders that it must pay the costs of the suit.

The most important part of Judge Hickenlooper's decision came in connection with the consideration of the application of the O. J. Shafer Pattern Works. This is discussed in part as follows:

"The exact question in this case is whether, after the plaintiff's shop had been run as a non-union shop for more than four years, the defendants had a right to so conduct their campaign for membership, by the maintenance of pickets and a solicitation of plaintiff's employees, as to injure the plaintiff's business and deprive him of the services of his present employees, and this at a time when no strike was in progress at plaintiff's shop, and no disagreement between plaintiff and his employees as to wages or working conditions, and when all the plaintiff's employees are employed upon the understanding and agreement that they would not join the union while in plaintiff's employ, and if it be decided that the defendants were within their rights in approaching any of the plaintiff's employees, will an injunction issue against soliciting such employees as have signed the non-union agreement referred to?"

Argument upon this question was based largely upon the Federal Court decision in the suit of the Hitchman Coal and Coke Co. against John Mitchell, and others, in which, by arbiter, the Court held that interference with the relationship of master and servant is actionable, and the self-interest of the union is not a justification for enticing an employee.

Says Cases Are Dissimilar

Judge Hickenlooper, while concurring in the principal grounds of this decision, says the present cases are somewhat dissimilar, as it does not appear any effort was made to get employees to join the union and still remain in the company's employ and thereby effect a unionization of the shop, but to induce employees to quit and then join the union. Regarding the salient points, the Court says:

"There cannot now be any doubt of the right of the employer to hire whomsoever he pleases and to conduct his business in such manner as to him seems advisable. Nor is there any doubt of the right of the employee to work for whom he pleases and upon such terms as he may desire. Employees

may organize and, where there is no contract for a definite term, may quit work either singly or in a body. These rights are of equal dignity and are reciprocal, and, at least as far as the rights of the employer and his non-striking employees are concerned, they are interdependent. To hold that the employer has the right to freely employ any servant and to retain the services of such employee as long as the conditions of employment are mutually satisfactory, necessarily implies that the non-striking employee must be left free to accept employment upon the terms offered.

"Both such rights of the employer and the employees are guaranteed by Section 1, Article 1, of the constitution of the state, which insured to all men the right of enjoying and defending life and liberty, acquiring, possessing and protecting property and seeking and obtaining happiness and safety."

RIGHTS OF OTHERS INVOLVED

Under the constitution the defendants claimed the right to freely speak and publish their sentiments as an inalienable right. Of this Judge Hickenlooper says: "Such rights are not absolute, although guaranteed by the constitution. They may not be exercised under any and all circumstances and without qualification, but where the exercise of such rights operates to limit and impair the enjoyment by another of rights of equal dignity there must be justification in order that there may be immunity from liability."

In the absence of a contract for a definite term of employment, Judge Hickenlooper says, "the advantages to society which are claimed for unionism furnish the just cause or excuse for the intentional injury occasioned by a strike. If, therefore, the employment be at will and the advantages of organization constitute just cause and excuse for persuading others to join the labor movement, it follows that picketing is not per se illegal, and it further follows that the Court must reject as unsound dictum of the Hitchman case that inducing a servant to quit his employment, which is at will, may be enjoined where there is no contract restricting the employee's right to enter into attending negotiations. We do not consider, therefore, that it is unlawful for the union to use peaceful persuasion for the purpose of inducing those of the plaintiff's employees who have not signed the non-union agreement or verbally agreed to its terms to quit their employment and join the labor movement.

"But to induce another to breach his contract has never been held to be justified by either social or individual advantages. No guaranteed right of free speech or liberty of action has ever been held to authorize or justify one man in inducing another to break a contract.

"Nor is the alleged non-union contract illegal or contrary to public policy. Any employee has the right to agree with his employer that he will not only refrain from joining a union during the term of employment, but he may also lawfully agree, as was done in these cases, that he will not have any negotiations or communication with others as to such employment, during the period that he is so employed.

BREACH OF CONTRACT

"Inducing such employee to enter into negotiations, or to participate in discussions as to the advantages of the union or as to his employment, is inducing a breach of contract into which he has entered; and such negotiations, conferences or discussions cannot be initiated or started by defendants without liability for inducing such a breach of contract. As has been said before, the advantages of the union cannot be held to be a justification of such act. The most that could be said of those who are employed under the non-union agreement in question is that, if and when their employment has terminated, the union representatives would be glad to discuss with them the advantages of the union. This is a meager and unsatisfactory right for which even the union does not contend.

"Further than this, the Court holds that each day does not constitute a unit of employment, but the contract is in force even when the employees are not at their place of employment, between closing time one day and the commencement of work the next, and it so continues in force until it is terminated by the employee leaving the employment of the employer."

United States Will Not Recognize Soviet Russia

Regardless of any action that may be taken by Great Britain or other Allied Nations with respect to resumption of trade with Soviet Russia, the United States has no intention of going further than its recent action.

Government officials are firm in their stand that there shall be nothing approaching recognition of the Soviet Government. The recent lifting of the embargo on trade with Russia, they point out, is in no sense a recognition of that Government, in view of the fact that the State Department announced it would continue to refuse to issue passports and that there would be no mail communication.

It was also reiterated that the United States will have no part in any conference at London, or other points, relative to resumption of Russian trade, and that whatever action may be taken there will have no bearing upon the attitude of this Government.

Announcement comes from Geneva that a silencer for airplane engines, more highly developed than an automobile muffler, has been invented by the chief engineer of a Swiss airplane firm.

Europe Looks to United States for Steel, Says Howell

The world-wide shortage of iron and steel resulting from the war can only be made good by the United Sates, says Herbert P. Howell, vice president of the National Bank of Commerce in New York, in an article on "The International Market for Iron and Steel," which appears in the July number of *Commerce Monthly*, the bank's magazine of commerce and finance.

Great Britain alone of the European producers is today capable of competition with this country in supplying the four years' cumulative demand, according to Mr. Howell. Neither France, Germany nor Belgium can be regarded as potential rivals of the American iron and steel industry at present.

GERMANY OUT FOR PRESENT

"The world is short of iron and steel," Mr. Howell says. "The United States, Great Britain and Germany produce 80 per cent or more of the total iron and steel output of the world, while Belgium is a considerable factor in the international market. The war had varying effects on the industries of these three European countries. The case of Germany is clear. As a producer of iron and steel for the international market, that country need not be reckoned with at present. French production is dependent on German coal, and lack of fuel and industrial disorganization have thus far kept it much below the pre-war level. The Belgian industry shows encouraging features and exports are increasing, but domestic demand is heavy and the amount Belgium can export will not greatly affect the international market in the immediate future.

"Even assuming a production of pig iron in 1920 equal to that of the best war year, and a rate of export somewhat higher than that of the pre-war years, the exportable surplus of the United States is not likely to equal Germany's annual exports in the years immediately preceding 1914. The United Kingdom is unable at present to recover volume of exports except at a sacrifice of domestic needs. There can be no question, therefore, as to sufficient foreign outlets for all the United States can spare and more."

Government Decree for Control of German Iron Trade

Acting Commercial Attaché Henry F. Grady reports from The Hague, Netherlands, that by a decree of the German National Government, dated April 1, 1920, there was established for the control of the iron trade, an autonomous body with legal standing called the "Eisenwirtschaftsbund" (Iron Trade Control Association) with headquarters at Duesseldorf. A translation of this decree may be perused at the Bureau of Foreign and Domestic Commerce on referring to file No. 42075.

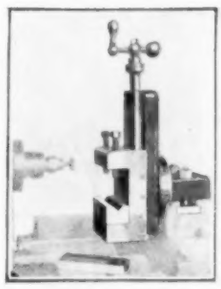
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Milling Attachment, Davis

Hinckley Machine Works, Hinckley, Ill.

"American Machinist," June 26, 1920



This attachment is held on the tool carriage of a lathe and serves as a handy device for doing a great variety of milling such as keyseating, squaring ends of shafts, sawing, splitting bushings, drilling and boring. The illustration shows the attachment in one position on the compound rest of a lathe. By swinging the compound rest it can be brought to any desired angle. Specifications: Vertical hand feed, 7 in., graduated to 0.001 in. Will swivel in vertical plane to 180 deg. Vise jaws, 1¾ in. deep; 5¼ in. wide; maximum opening, 4 in. Weight, net, 50 lb.; boxed for shipment, 65 lb.

Riveter, Baird Yoke

Baird Pneumatic Tool Co., Kansas City, Mo.

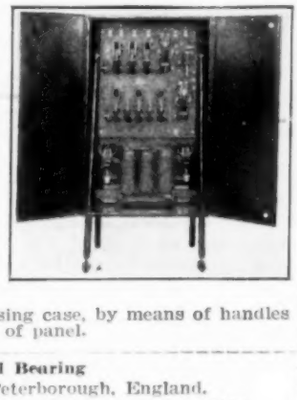
"American Machinist," June 26, 1920

The riveter is supported on a stand instead of being suspended by a bail. The arrangment of the riveter and stand is intended for use in riveting traction plates on the rims of pneumatic tires. The riveter has a 10-in. reach, a 9-in. gap and will deliver a maximum squeeze of 70 tons with 100 lb. air pressure.

Starter, Induction Motor, Automatic

The General Electric Co., Schenectady, N. Y.

"American Machinist," June 26, 1920



This starter is designed to start by push button, or by operation of a float switch, pressure governor or similar accessory. The starter consists of one 5-pole contactor for starting, one 3-pole contactor for running, a current-limit relay for controlling the contactors, two inverse-time-element overload relays and a set of compensator coils. All this apparatus is mounted on a panel and inclosed in a case which can be locked shut when desired. Overload protection is furnished by the two inverse-time-element relays, which are operative during both starting and running. After an overload they may be reset without removing the cover of the inclosing case, by means of handles which project through on the back of panel.

Lathe, 72 In. Adjustable Gap

Fairbairns, Leeds, England.

"American Machinist," (European Edition) June 26, 1920

The 72-in. adjustable gap lathe was designed for turning propellers up to 20 tons in weight. Length of the bed is 12 ft. 6 in. Maximum diameter admitted in pit is 18 ft. Maximum distance between the 9 ft. faceplate and bed is 6 ft. Distance between the centers with the gap open is 13 ft. The headstock is mounted on a separate base. Forged steel spindle runs in phosphor bronze and the front bearing is 14 in. diameter by 21 in. long. Drive is by 30-hp., two-speed squirrel-cage motor. There are three ratios of gearing, all double helical, which, in combination with the motor, give faceplate speeds from 2.6 to 39.5 r.p.m. The tailstock has an 8-in. steel spindle, which is traversed by handwheel. Movement along the bed is through worm gearing, pinion and rack. Length over the headstocks is 25 ft. 6 in. Approximate weight, 36 tons.

Grinding Machine, Twist Drill, Ball Bearing

H. F. Atkins Ltd., Old Fletton, Peterborough, England.

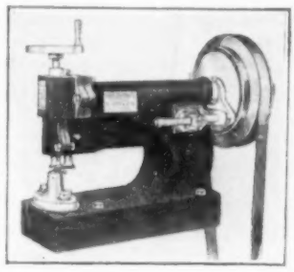
"American Machinist," (European Edition) June 26, 1920

The countershaft is built into the machine and runs on ball bearings. In capacity the machine will grind drills of from ¼ in. to 2¼ in. diameter. Three-lip drills can be ground readily, provision for them being made by a small screw which limits the motion of the vee arm. As sent out, the appliance produces standard clearance on the drills, but if desired this can be varied, and only two simple adjustments are needed for correct grinding of any drill. The main wheel is a ring 8½ in. diameter and at the rear end of the spindle a point-thinning wheel is mounted. Guards are provided to each and a centrifugal pump, belt-driven is included. Net weight, about 400 lb.

Nibbling Machine, Metal

T. H. Wilson Ltd., Bramley, near Leeds, England.

"American Machinist," (European Edition) June 26, 1920

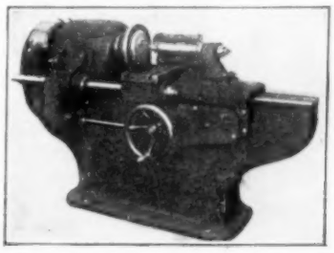


This machine is intended for nibbling or perforating metal or other materials up to ½ in. in thickness. The machine is made in three sizes. A special punch is employed in the form of a round cutter, down the center of which is a loose pin projecting beyond the cutting edge, forming a stop for the work. The bottom die is of ordinary form corresponding to the punch and the latter is actuated by an eccentric pin on the end of the spindle. The speed of the machine ranges from 300 to 750 r.p.m., according to the material to be cut.

Lathe, Piston and Piston Ring Automatic

T. Rider & Son Ltd., Bolton, England.

"American Machinist," (European Edition) June 19, 1920

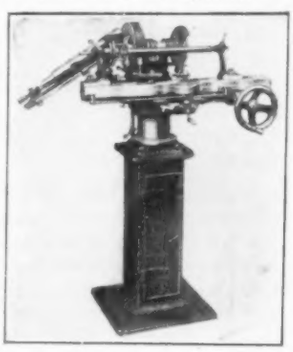


The lathe is specially designed for cast iron work. Turning outside diameters, the tool is bolted direct on a long carriage and it is possible to work to close limits in one cut. For turning pistons roughing and finishing sliding tools are followed by two roller follower rests which take the thrust of back grooving tools. When the outside turning tools have traveled about three-quarters of the length of piston the grooving tools come into operation. On the front slide is a sizing tool or tools, to finish the top lands between the ring grooves. The back forming tools maintain the piston in close contact with follower rests and thus the lands can be sized to within plus or minus 0.002 in. Net weight of machine, about 3,500 lb.

Grinding Machine, Twist Drill and Cutter

S. Holmes & Co., Bradford, England.

"American Machinist," (European Edition) June 19, 1920.



This machine will grind twist drills from ¼ in. diameter, and when arranged to grind milling cutters will take 25 in. between center by 10 in. diameter. Carriage is 34 in. long, has longitudinal motion of 20 in. cross motion of 5 in. and vertical adjustment of 4½ in. One end of spindle is bored No. 1 Morse taper. It will be seen that in this machine the table swings round the head. The grinding wheel for twist drills is 9 in. x 1½ in. Attachments supplied for internal grinding. The machine has a base 21 in. square. Height to center of the spindle 46 in. Weight, about 600 lb.

Clip, paste on 3 x 5-in. cards and file as desired

Leroy S. Starrett (Right) Celebrates Birthday

"Ad astra per ardua," the motto of the British Flying Corps, has become literally true in the case of Leroy S. Starrett, president of the L. S. Starrett Co., of Athol, Mass., who recently celebrated his 84th birthday by a "trip to the clouds" at St. Petersburg, Florida.

Business Items

Dewey, Strong & Townsend announce the entry of Captain William A. Loftus, Thomas Castberg, James M. Abbett and John H. Herring into the firm which will be known as Dewey, Strong, Townsend & Loftus. Mr. Herring will have charge of the trademark and foreign department; Mr. Abbett will specialize in chemical and electrical patent matters, and Mr. Castberg will devote his attention to engineering and industrial patent cases. Captain Loftus, lately in the service abroad and formerly in the patent department of the International Harvester Co., will practice both before the Patent Office and the Federal courts. William H. Bauer, formerly of Washington and lately with the patent department of the Willys-Overland Co., will continue on the staff. Mr. Strong, after more than fifty years of active practice, will retain his association in an advisory capacity. The practice of patent and trademark law will be continued by Chas. E. Townsend at the same address, 909-917 Crocker Building, San Francisco.

The Cooper Hewitt Electric Co. will remove its St. Louis office on Aug. 1 to the Title Guaranty Building. Mr. A. H. Smith is the district sales manager.

Contract has been let to Swift & Co., of Chicago, by the Central of Georgia Railway, for the construction of its new shops and roundhouse at Columbus, Ga. Work is to start in the near future and the contractors promise completion of the shops by March, 1921. Mastermechanic Gross, of Columbus, stated that the work would entail an investment of about $500,000.

Plans for the issue of $25,000,000 8 per cent and participating stock of the British Empire Steel Corporation simultaneously in London and Montreal, with the possibility of a New York connection, are announced. It is expected that Premier Gouin, of Quebec, may retire from the Provincial Cabinet and become chief counsel for the corporation.

The quarterly report of the Lackawanna Steel Co. for the second quarter of this year shows an astonishing gain. For the first quarter of the year this company showed a deficit of $449,720, whereas for the quarter ending June 30 there was a surplus of $1,881,946.

Forthcoming Meetings

The International Railway Master Blacksmiths' Association will hold its next annual convention at Tutwiler Hotel, Birmingham, Ala., on Aug. 17, 18 and 19. The secretary of the association is A. L. Woodworth, Lima, Ohio.

The National Gas Engine Association, Monadnock Bldg., Chicago, Ill., will hold its thirteenth annual convention at the Congress Hotel, Chicago, on Sept. 1, 2 and 3.

The American Steel Treaters' Society and the Steel Treating Research Society will hold their second annual convention and exhibition at the Commercial Museum, Philadelphia, Pa., on Sept. 14 to 18, inclusive. J. A. Pollack, of the Pollak Steel Co., Cincinnati, Ohio, is secretary of the former society.

The American Foundrymen's Association will hold its annual convention and exhibit at Columbus, Ohio, on Oct. 4 to 9. C. E. Hoyt, 1401 Harris Trust Building, Chicago, Ill., is secretary.

An exposition of U. S. manufacturers at Buenos Aires, Argentine Republic, S. A., has been arranged for the month beginning Nov. 15. Information can be obtained from the American National Exhibition, Inc., Bush Terminal Sales Building, 132 West 42nd St., New York.

Personals

DR. T. S. TAYLOR, who has during the first part of the present calendar year, been in charge of the research work for the Magnesia Association of America at the Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa., returned on July 1 to the Research Laboratory of the Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa., to take charge of their thermal research.

EARL STAFFORD has become a member of the engineering staff of Arthur D. Little, Inc., chemists and engineers, Cambridge, Mass. Mr. Stafford is a graduate of the engineering school of Tufts College, 1908, and for the past twelve years has devoted his attention largely to hydro-electric developments with particular reference to ore treating plants, pulp and paper mills and light and power companies.

W. S. QUIGLEY, president of the Furnace Specialties Co., New York, sailed for France on the Imperator, July 15. Mr. Quigley's trip is for the purpose of furthering the business relations of the Quigley organization in England, France, Belgium, Italy and Spain.

C. N. LEO, formerly with the W. M. Pattison Supply Co., has resigned and is now with the Hess, Schenck Co., Cleveland, Ohio.

C. R. SYME has resigned from the W. M. Pattison Supply Co. and will represent the Hess, Schenck Co., of Cleveland, Ohio, in Dayton and Southern territory.

FRANK J. FARRELL has been appointed Eastern representative for the Precision and Thread Grinder Manufacturing Co., of Philadelphia, Pa., manufacturer of the multi-graduated precision grinder.

THOMAS P. ORCHARD has resigned as secretary and sales manager of the Service Engineering Co., Inc., to accept an appointment as director of sales with the Arthur Knapp Engineering Corporation of New York and Detroit.

JAMES L. GOUGH has disposed of his interests in the Federal Machinery Sales Co., Chicago, Ill.

W. D. CREIDER, who was formerly president of the Saxer-Creider Machinery Co., Erie, Pa., and who for the past two years was manager of the Modern Tool Co., has become sales manager of the Chicago branch of the Reed-Prentice Co., Becker Milling Machine Co., and the Whitcomb-Blaisdell Machine Tool Co. This branch will be located at 28 North Clinton St., after Aug. 15.

ROBERT R. LASSITER, formerly mechanical superintendent of the Richmond Forgings Corporation, Richmond, Va., has recently joined the Dale-Brewster Machinery Co., Inc., New York. Mr. Lassiter is assistant to the president, in charge of engineering sales, and is also part owner of the company.

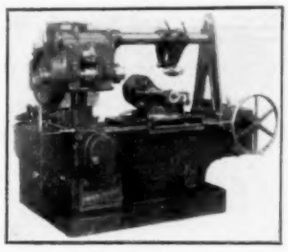
Condensed-Clipping Index of Equipment

Patented Aug. 20, 1918

Hobbing Machine, Cincinnati 16-In. Gear

Cincinnati Gear Cutting Machine Co., Cincinnati, Ohio

"American Machinist," July 15, 1920

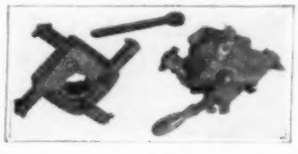


Specifications: Rated capacity; diameter, 16 in.; face, 12 in. Actual maximum gear diameter, 17¼ in. Rated capacity; spur gears, 3 D.P.; cast-iron helical gears, 3 D.P.; steel helical gears, 3½ D. P. Maximum distance, center of hob to nose of spindle, 19½ in. Maximum diameter of hob, 4½ in. Diameter hob arbor, 1¼ in. Taper hole in work spindle, No. 12 B. & S. Hob speed, 8 changes, ranging from 50 to 200 r.p.m. Hob feeds, 26 changes, ranging from 0.015 to 0.250 in. per rev. of work. Driving pulley, 15 x 3½ in.; speed, 400 r.p.m. Over-all dimensions; covers closed, 52 in. x 82 in.; covers open, 56 in. x 103 in. Net weight of machine with electrical equipment, 5,600 lb.; domestic shipping weight, 5,900 lb.; export shipping weight, 6,600 lb. Contents boxed for export, 210 cu.ft.

Toolpost, Lovejoy Turret

Lovejoy Tool Co., Inc., Springfield, Vt.

"American Machinist," July 15, 1920

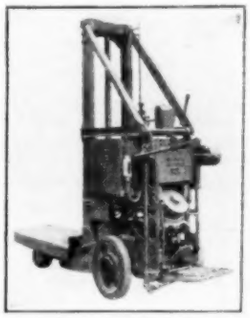


The turrets are made of hardened steel and are interchangeable with any base. This feature permits the use of a number of turrets carrying tool combinations for various jobs so that a job can be changed without changing the tool set-up. Two types of turrets are regularly made, one for turning and the other for boring. The turning toolholders have shanks 1 in. in diameter and are fitted with ½-in. high-speed steel cutters. The round shanks permit the holders to be rotated to give side clearance to the tools. The boring bars are 1 in. in diameter and will cut to the bottoms of holes that are only slightly larger than the bars. Bars of other sizes with bushings to fit holes in turrets can be furnished to order. The turrets can be used on lathes having a center distance above the tool block as small as 1⅝ inches.

Truck, "Automatic" Lifting and Tiering

Automatic Transportation Co., Buffalo, N. Y.

"American Machinist," July 15, 1920



The function of this truck is to pick up and elevate loads with its own power, to suitable heights for placing material in box cars, on trucks, wagons, etc., without rehandling. It has a capacity to lift a load of 4,000 lb. any distance from 1 in. to 6 ft., and at the rate of 1 ft. in 15 seconds. The overhanging platform is supported on two sturdy uprights. It is provided with substantial guide rollers, and is raised and lowered by a single screw of large size revolving in a heavy bronze nut carried in a trunnion. An oil reservoir furnishes ample lubrication to the screw. The platform may be started and stopped at any point in its travel, and automatic limit cutouts are provided to prevent overrun at either extreme.

Chuck, Gustin-Bacon Reversible Driving

Gustin-Bacon Manufacturing Co., 1416-18 West Twelfth St., Kansas City, Mo.

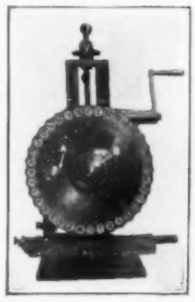
"American Machinist," July 15, 1920

The chuck grips when driven in either direction, being especially designed for service when it is desirable to reverse the direction of rotation, as in running staybolts in fire boxes and in driving straight-shank taps. The jaws shown are used for holding round bars; one size, suitable for accommodating bolts from ½ to 1¼ in., being carried in stock, while other sizes can be furnished upon order. Jaws for holding square heads can be furnished, the stock size accommodating square heads from ⅝ to ⅞ in. The jaws are tool steel, and can be easily replaced when worn out. It is claimed that the chuck grips the bolt centrally, so that it runs true. The base of the chuck shank is squared to 1¼ in., so as to permit the setting of a staybolt with a wrench when desired.

Stampograph, Merey Rotary

Julius Merey, 2842 North Maplewood Ave., Chicago, Ill.

"American Machinist," July 15, 1920

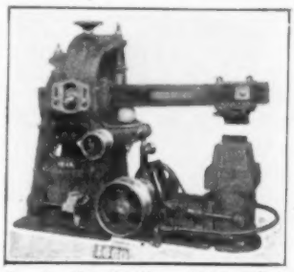


The machine is designed to stamp letters, characters, etc., in metal or other material while it is in a soft or plastic condition, and is ordinarily furnished for hand operation, but can be arranged for power operation when required. The machine is self-contained and has a stamping capacity of thirty-five characters, as indicated on the face of the dial. Provision is made, however, for changing the size of the characters to suit the work being stamped. Adjustment for work of different thickness is accomplished by means of the ball crank at the top of the machine and incidentally this regulates the depth of the impression. The hand-power machine weighs about 200 lb. The power-operated machine weighs 350 lb. and occupies a bench space about two feet square.

Hammer, American Helve

Long & Allstatter Co., Hamilton, Ohio

"American Machinist," July 15, 1920

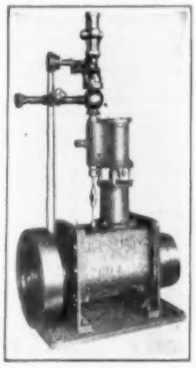


The hammers are made in five sizes, ranging from 25 to 100 lb. capacity. It is claimed that all connections and parts that have a tendency to work loose are carefully protected against such trouble. The treadle is arranged to prevent lost motion between it and the belt tightener and is said to be sensitive and smooth acting in regulating the force and rapidity of the blows. The steel brake-band with its friction lining passes almost entirely around the brake wheel and, owing to its great area of friction surface, assures quick stopping of the hammer with the helve in the "up" position when the treadle is released. A pair of ordinary dies having faces partly flat and partly round is furnished as part of the regular equipment.

Engine, Underwood Steam or Air

H. B. Underwood Corporation, 1015-25 Hamilton St., Philadelphia, Pa.

"American Machinist," July 15, 1920

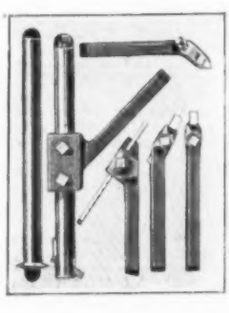


The engine is built in both a 3- and a 5-hp. size, and is designed for driving portable tools such as boring bars and drilling machines. The cylinder of the 3-hp. engine is 3¼ in. in diameter and that of the 5-hp. is 4¼ in. in diameter, both engines having a 3½-in. stroke. The working parts are inclosed in an oil-tight case which is formed in the base of the engine and serves to exclude dirt. The crankshaft is a steel forging with a 1½-in. finished diameter. A piston valve is used, and the engine is fitted with a governor on the supply line. The engine runs at 250 r.p.m. with 70 to 125 lb. supply pressure. The floor space required is 12 x 21 in., and the height to the top of the governor is 46 in. Net weight, 270 lb.

Tool Set, "Red E" Garage Lathe

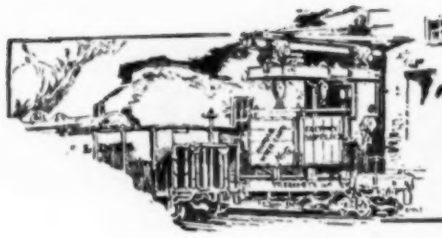
Ready Tool Co., Bridgeport, Conn.

"American Machinist," July 15, 1920



The set is intended for use in small machine shops and garages. It comprises tools for both inside and outside turning and threading, also a cutting-off tool. The tool board furnished with the tools has a place routed out for each individual tool, making it easy to keep the tools in their proper places and to note whether any are missing.

Clip, paste on 3 x 5-in. cards and file as desired



THE WEEKLY PRICE GUIDE

IRON AND STEEL

PIG IRON—Quotations compiled by The Matthew Addy Co.:

	Current	One Year Ago
CINCINNATI		
No. 2 Southern	$45.60	$29.80
Northern Basic	42.80	27.55
Southern Ohio No. 2	46.80	28.55
NEW YORK—TIDEWATER DELIVERY		
2X Virginia (Silicon 2.25 to 2.75)	49.65	31.90
Southern No. 2 (Silicon 2.25 to 2.75)	49.70	33.95
BIRMINGHAM		
No. 2 Foundry	42.00@44.00	25.75
PHILADELPHIA		
Eastern Pa., No. 2x, 2.25-2.75 sil.	46@48.25*	30.65
Virginia No. 2	45.00*	30.85
Basic	44.50†	29.90
Grey Forge	43.50*	29.90
CHICAGO		
No. 2 Foundry local	44.25	27.25
No. 2 Foundry, Southern	47.00	31.75
PITTSBURGH, INCLUDING FREIGHT CHARGE FROM VALLEY		
No. 2 Foundry	45.65	28.15
Basic	44.40	27.15
Bessemer	44.90	29.35
MONTREAL		
Silicon 2.25 to 2.75%	43.25	.....

* F.o.b. furnace. † Delivered.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.47	$3.97	$3.47	$5.00	$3.37	$3.97	$3.47
Soft steel bars	4.62	4.12	3.37	4.50	3.27	3.87	3.37
Soft steel bar shapes	4.62	4.12	3.37		3.27	3.87	3.37
Soft steel bands	6.32	5.32	4.07	6.25			
Plates, ¼ to 1 in. thick	4.67	4.17	3.67	4.50	3.57	4.17	3.67

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Mill, Pittsburgh	$4.25	$2.75
Warehouse, New York	4.57	3.37
Warehouse, Cleveland	3.52	3.22
Warehouse, Chicago	3.75	3.37

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	New York Current	New York One Year Ago	Cleveland	Chicago
No. 10	3.55-7.00	7.12@8.00	4.57	8.10	7.02
No. 12	3.60-7.65	7.17@8.05	4.57	8.15	7.07
No. 14	3.65-7.10	7.22@8.10	4.67	8.20	7.12
No. 16	3.75-6.20	7.32@8.20	4.77	8.30	7.22
Black					
Nos. 18 and 20	4.20-6.20	7.80@9.50	5.30	8.70	7.80
Nos. 22 and 24	4.25-6.25	7.85@9.55	5.35	8.75	7.85
No. 26	4.30-6.30	7.90@9.60	5.40	8.80	7.90
No. 28	4.35-6.35	8.00@9.70	5.50	8.90	8.00
Galvanized					
No. 10	4.70-8.00	8.55@11.00	6.20	9.00	8.15
No. 12	4.80-8.10	8.65@11.00	6.25	9.10	8.20
No. 14	4.80-8.10	8.65@11.10	6.30	9.10	8.35
Nos. 18 and 20	5.10-8.40	8.90@11.40	6.60	9.40	8.65
Nos. 22 and 24	5.25-8.55	9.05@11.55	6.75	9.55	9.05
No. 26	5.40-8.70	9.20@11.70	6.90	9.70	9.20
No. 28	5.70-9.00	9.50@12.00	7.20	10.00	9.50

Acute scarcity in sheets, particularly black, galvanized and No. 16 blue enameled.

Automobile sheets are unavailable except in fugitive instances, when prices are 9.45c per lb. for No. 16; 9.50 for Nos. 18 and 20, and 9.55c for Nos. 22 and 24.

COLD FINISHED STEEL—Warehouse prices are as follows:

	New York	Chicago	Cleveland
Round shafting or screw stock, per 100 lb. base	$6.25	$5.80	$6.00
Flats, square and hexagons, per 100 lb. base	6.75	6.30	6.50

DRILL ROD—Discounts from list price are as follows at the places named:

	Per Cent.
New York	50
Cleveland	50
Chicago	50

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots is:

	Current	One Year Ago
New York	$20.00	$21.00–26.00
Cleveland	20.00	20.00
Chicago	21.00	16.50

In coils an advance of 50c. usually is charged.

Domestic iron (Swedish analysis) is selling at 12c. per lb.

WELDING MATERIAL (SWEDISH)—These prices are the best we have been able to obtain for Swedish welding materials, of which it is reported that very little are on the market.

Welding Wire		Cast-Iron Welding Rods	
5/32, 3/16, 7/32, 1/4, 5/16, 3/8	21.00 to 30.00	1/8 by 12 in. long	14.00
No. 8, 9/32 and No. 10		3/16 by 19 in. long	12.00
1/2		1/4 by 19 in. long	10.00
No. 12		1/4 by 21 in. long	10.00
5/16, No. 14 and 11/32		**Special Welding Wire, Coated**	
No. 18		1/4	33.00
No. 20		5/16	30.00

Domestic—Welding wire in 100-lb. lots sells as follows, f. o. b. New York: 5/32, 8½c. per lb.; 1/4, 8c.; 5/16 to 1/2, 7½c.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Openhearth spring steel (heavy)	7.00	8.00	9.00
Spring steel (light)	10.00	11.00	12.25
Coppered bessemer rods	9.00	8.00	6.75
Hoop steel	6.57	6.50	5.32
Cold-rolled strip steel	12.50	8.25	10.75
Floor plates	6.80	6.00	6.77

PIPE—The following discounts are to jobbers for carload lots on the Pittsburgh basing card, discounts on steel pipe, applying as from January 14, 1920, and on iron pipe from January 7, 1920.

BUTT WELD

Steel Inches	Steel Black	Steel Galvanized	Iron Inches	Iron Black	Iron Galvanized
¼ to 3	54-57½%	41½-44%	¼ to 1¼	24½-34½%	8-18½%

LAP WELD

2	47-50½%	34½-38%	1¼		
2½ to 6	50-53½%	37½-41%	1½		
7 to 12	47-50½%	33½-37%	2	20½-28½%	6½-14½%
13 to 14	37½-41%		4½ to 6	22½-30½%	9½-17½%
15	35-38½%		2½ to 4	22½-30½%	9½-17½%
			7 to 12	19½-27½%	6½-14½%

BUTT WELD, EXTRA STRONG PLAIN ENDS

¼ to 1½	52-55½%	39½-43%	¼ to 1½	24½-34½%	9½-19½%
2 to 3	53-56½%	40½-44%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	45-48½%	33½-37%	1¼		
2½ to 4	48-51½%	36½-40%	1½		
4½ to 6	47-50½%	35½-39%	2	21½-29½%	8½-16½%
7 to 8	43-46½%	29½-33%	2½ to 4	23½-31½%	11½-19½%
9 to 12	38-41½%	24½-28%	4½ to 6	22½-30½%	10½-18½%
			7 to 8	14½-22½%	2½-10½%
			9 to 12	9½-17½%	5½+2½%

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
¼ to 3 in. steel butt welded	40%	24%	40%	31%	54%40%	40½@30%
2½ to 6 in. steel lap welded	35%	20%	42%	27%	50@40%	37½@27½%

Malleable fittings. Classes B and C, banded, from New York stock sell at plus 32%. Cast iron, standard sizes, net.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	Month Ago	Year Ago
Copper, electrolytic	19.00	19.25	21.75
Tin in 5-ton lots	49.50	61.50	70.00
Lead	9.25	9.00	5.50
Zinc	8.25@8.75	8.70	8.00
ST. LOUIS			
Lead	8.90	8.87½	5.25
Zinc	7.90@8.40	8.37½	7.65

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York Current	New York Month Ago	New York Year Ago	Cleveland Current	Cleveland Year Ago	Chicago April 8 Current	Chicago April 8 Year Ago
Copper sheets, base	33.50	33.50	29.50	32.00	33.50	36.00	36.50
Copper wire (carload lots)	31.25	31.25	26.50	29.50	29.50	27.00	25.00
Brass sheets	28.50	28.50	23.00	29.00	29.00	27.00	28.00
Brass pipe	33.00	33.00	34.00	34.00	36.00	35.00	37.00
Solder (half and half) (case lots)	38.00	33.00	45.00	40.50	41.00	38.00	41.00

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 2c.; polished takes 5c. per sq.ft. extra for 20-in. widths and under; over 20 in., 7½c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; net extra:

	Current	One Year Ago
Mill	25.00	19.00
New York	27.00	21.50
Cleveland	27.00	30.00
Chicago	26.00	30.00

SHOP MATERIALS AND SUPPLIES

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill..... 12.50

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	15.00	12.95	15.50	13.30
New York	14.00	12.00	14.50	13.00
Chicago	15.00	16.50	15.00	16.00

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots for spot delivery, duty paid:

	Current	One Year Ago
New York	8.00	8.37½
Chicago	9.50	10.00

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York			
	Current	One Year Ago	Cleveland	Chicago
Copper, heavy, and crucible	16.00	16.75	15.50	15.50
Copper, heavy, and wire	15.25	15.75	15.00	15.00
Copper, light, and bottoms	13.00	13.50	13.00	14.00
Lead, heavy	7.00	4.62½	7.00	7.00
Lead, tea	5.00	3.75	5.00	6.00
Brass, heavy	10.25	10.00	11.00	15.50
Brass, light	7.50	8.00	8.00	9.50
No. 1 yellow brass turnings	8.50	9.00	8.50	9.50
Zinc	5.25	4.25	4.50	9.50

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, 98 to 99% pure, in ingots for remelting (1-15 ton lots), per lb	33.00	34.00c.@35.00c.	33.50

COPPER BARS—From warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York (round)	38.00	25.00
Chicago	29.00	28.00
Cleveland	32.00	33.00

BABBITT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	90.00	90.00	74.00	80.00	60.00	75.00
Commercial	50.00	50.50	21.00	18.50	15.00	15.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	+ $6.00	$3.25	$ .50	$2.25	$ .50	1.05
Hot pressed hexagon	+ 6.00	2.70	.50	2.25	.50	.85
Cold punched hexagon	+ 6.00	3.25	.50	2.25	.50	1.00
Cold punched square	+ 6.00	2.70	.50	2.25	.50	1.00

Semi-finished nuts, ⅜ and smaller, sell at the following discounts from list price:

	Current	One Year Ago
New York	30%	50-10%
Chicago	50%	50%
Cleveland	50%	60-10-10%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	+ 20%	20%	20%
Larger and longer up to 1½ in. by 30 in.	+ 20%	20%	10%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:

New York..... list Cleveland..... $2.50 Chicago..... $3.00

For cast-iron washers, ⅜ and larger, the base price per 100 lb. is as follows:

New York..... $7.00 Cleveland..... $4.50 Chicago..... $4.75

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
½ by 6 in. and smaller	+ 20%	35%	10%
Larger and longer up to 1 in. by 30 in.	+ 20%	20%	5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	20%	20%	10%	10%
Chicago	net	20%	net	20%
New York	25%	40%	net	20%

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅛ and smaller	List Net	40%	30%
Tinned	List Net	40%	30%

Boiler, ½, ⅝, 1 in. diameter by 2 to 5 in. sell as follows per 100 lb.:

New York..... $6.00 Chicago..... $5.62 Pittsburgh..... $4.50

Structural, same sizes:

New York..... $7.10 Chicago..... $5.72 Pittsburgh..... $4.60

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	34.00	34.00	35.00
Brass	33.00	34.00	34.00

The prices, of course, vary with the quantity purchased. For lots of less than 100 lb., but not less than 75 lb., the advance is 1 c.; for lots of less than 75 lb., but not less than 50 lb., 2½c. over base (100-lb. lots); less than 50 lb., but not less than 25 lb., 5c. should be added to base price; quantities from 10-25 lb., extra is 10c.; less than 10 lb., add 15-20c.

Double above extras will be charged for angles, channels and sheet metal mouldings if ordered in above quantities. Above extras also apply to brass rod other than standard stock sizes—stock sizes being considered as ⅛-2 in. inclusive in rounds, and ¼-1½ in., inclusive, in square and hexagon—all varying by thirty seconds up to 1 in. by sixteenths over 1 in. On shipments aggregating less than 100 lb., there is usually a boxing charge of $1.50.

LONG TERNE PLATE—In Chicago No. 28 primes from stock sell, nominally, for $12.50 per 100 lbs.

In Cleveland—$10 per 100 lbs.

COTTON WASTE—The following prices are in cents per pound:

	New York			
	Current	One Year Ago	Cleveland	Chicago
White	15.00@17.00	13.00	16.00	11.00 to 14.00
Colored mixed	9.00@14.00	9.00-12.00	12.00	9.50 to 12.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½x13½	13½x20½
Cleveland	55.00	65.00
Chicago	41.00	43.50

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.00	$3.00	$1.75
Philadelphia	2.75	2.75	1.75
Cleveland	3.00	2.50	2.75
Chicago	2.25	2.50	2.00

ROLL SULPHUR in 360-lb. bbl. sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$3.90	$3.90	$3.65
Philadelphia	3.65	3.65	3.62
Chicago	5.00	5.00	4.12½

COKE—The following are prices per net ton at ovens, Connellsville:

	July 8	July 1	June 24
Prompt furnace	$17.50@$18.50	$17.50@$18.50	$15.00@$16.00
Prompt foundry	18.00@19.00	18.00@19.00	16.00@17.00

FIRE CLAY—The following prices prevail:

		Current
Ottawa, bulk in carloads	Per Ton	$8.00
Cleveland	100-lb. bag	1.00

LINSEED OIL—These prices are per gallon:

	New York		Chicago	
	Current	One Year Ago	Current	One Year Ago
Raw in barrels (5 bbl. lots)	$1.53	$2.15	$1.95	$2.53
5-gal. cans (without cans)	1.56*	2.28	2.15	2.73

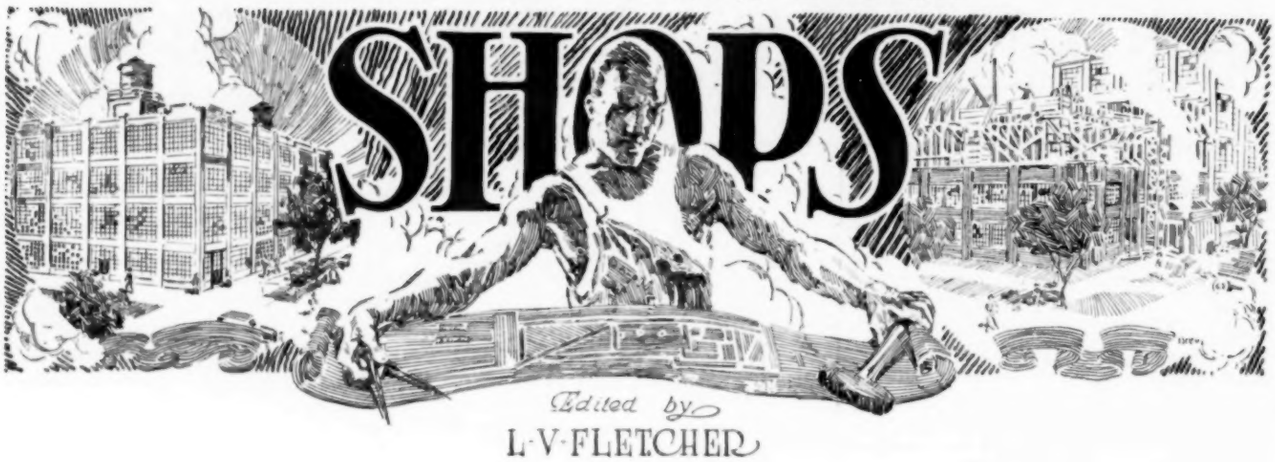
*To this *oil* price must be added the cost of the cans (returnable), which is $2.25 for a case of six.

WHITE AND RED LEAD—Base price per pound:

	Red				White			
	Current		One Year Ago		Current		One Year Ago	
	Dry	In Oil	Dry	In Oil	Dry and In Oil		Dry and In Oil	
100 lb. keg	15.50	17.00	13.00	14.50	15.50	13.00		
25 and 50-lb. kegs	15.75	17.25	13.25	14.75	15.75	13.25		
12½-lb. keg	16.00	17.50	13.50	15.00	16.00	13.50		
5-lb. cans	18.50	20.00	15.00	16.50	18.50	15.00		
1-lb. cans	20.50	22.00	16.00	17.50	20.50	16.00		

500 lb. lots less 10% discount. 2000 lb. lots less 10-2½% discount.

NEW *and* ENLARGED



Edited by
L. V. FLETCHER

Machine Tools

The following concerns are in the market for machine tools:

Conn., Hartford—The city of Hartford—machine shop equipment.

Conn., Hartford—The Puritan Motor Sales Co., 334 Pearl St.—repair shop equipment.

Mass., Boston—The Roxbury Motor Co., 133 Humboldt Ave.—repair shop equipment.

Mass., Everett—L. Albaum, 49 Malden St.—repair shop equipment.

Mass., New Bedford—The Manomet Mills—miscellaneous machine tools.

N. Y., New York (Borough of Manhattan)—A. Stroud, 327 Bway.—Five boring mills, 42 in., one turret head, swivel head.

Three 24 in. Bullard boring mills.

Two Cleveland, model "A," 2 in. standard automatic screw machines.

Three Cleveland, model "A," 4¼ in. standard automatic screw machines.

One Cleveland, model "A," 6¾ in. standard automatic screw machine.

Twelve porter cable lathes.

One 16 in. Lees Bradner, G & E, or Adams, spiral gear hobber.

One Potter & Johnson, 7 in. turret lathe.

One 2 spindle, Henry & Wright, class "B," drill.

One Briggs, model "B," 42 in. table feed miller.

One Fisher oil groover.

One Landis 12 x 96 plain grinder.

N. Y., New York (Borough of Manhattan)—The United Machine Works, 55-57 West 3rd St.—One 36 or 42 in. triple geared belt driven heavy duty lathe, 20 in. between centers, with compound slide rest, change gears, steady rest, countershaft and clutch, etc.;

One belt driven lathe as above, 18 x 12 in. between centers;

One portable cylinder boring bar for sylinder up to 26 in. diameter x 72 in. long;

One portable cylinder boring bar for cylinder 4 to 8 in. diameter x 48 in. long;

One belt driven power hammer head, about 500 lbs.;

One 6 to 7 in. belt driven Sullivan air compressor;

One reversible air drill for drills up to 2½ in.;

One 60 or 72 in. belt driven radial drill;

One belt driven 24 in. or 30 in. crank shaper with table vise;

One 300 to 400 ton belt driven hydraulic press to take up to 48 in.;

One belt driven plate bending machine for plates ¼ to 12 in. long;

One heavy work blast forge with blower, size of pan 48 in.;

Three 300 lb. cast steel anvils;

Taper shank twist drills, from ½ to 2 in. in 64ths;

Taper sockets for above drills;

One belt driven twist drill grinder with counter shaft on column;

One belt driven grindstone about 48 in.;

One No. 2 universal milling machine;

Milling cutters for three 16 to 6 in. diameter and face;

Milling cutters for involute gears;

Milling cutters for epicycloidal gears;

One foundry cupola for about 6 or 7 tons;

One belt driven rotary blower;

Two combined crane and truck ladles, about 6,000 lbs. each;

Two wrought bull ladles about 200 lbs.;

Two crane ladles with shank and rail about 800 lbs.;

One 10 ton traveling crane, span about 25 ft.;

One circular saw sharpener;

One hand saw filer and setter;

One hundred feet of 2½ steel shaftings.

Ring oilers, 18 x 18 in.

Drop hangers, 2½ in. bore.

N. Y., New York (Borough of Manhattan)—The Williams Valve Co., 62 Front St.—one 24 in. universal turret lathe.

Pa., Germantown (Philadelphia Station)—The Queen Gray Co., 70 West Johnson St.—general machine tools.

Pa., Philadelphia—The Congoleum Co., Inc., Morris Bldg.—one 16 in. x 8 ft. engine lathe.

Pa., Philadelphia—H. D. Dougherty & Co., 17th and Indiana Sts.—one manufacturer's lathe, capacity up to 2 in.

Pa., Philadelphia—The Hartford Sterling Co., 24th and Locust Sts.—buffing and polishing lathes.

Pa., Pittsburgh—The Electric Welding Co., Riverbank—one alligator shear, capacity 1½ in. sq. steel, electric drive (used).

Pa., West Chester—The Sharples Specialty Co.—heavy duty drill presses.

Ala., Birmingham—The Manufacturers Selling Agency, Brown Marx Bldg.—one 1 in. single head bolt cutter, motor driven.

Ind., Terra Haute—The Amer. Car and Fdry. Co.—additional equipment for expansion, including lathes, foundries, etc.

Ind., Terra Haute—The Indiana Milling Co.—$50,000 worth of miscellaneous milling machinery.

Mich., Caro—Cooper & Striffler—garage equipment.

Mich., Detroit—The Elwood Machine and Tool Co., Sherman and Rivard Sts., W. T. Elliott, Mgr.—machine tool equipment for manufacture of dies.

Mich., Detroit—The C. E. Fales Mchy. Co., 100 Beaubien St.—one DDG No. 56 Darracute double action, 100 ton draw press (new or used).

Mich., Detroit—The Hayes Mchy. Co., East Larned St., A. Sprague, Purch. Agt.—large squaring shears.

Mich., Detroit—The James Machine Co., 427 Bellevue Ave.—miscellaneous machine shop equipment.

Mich., Detroit—The Pere Marquette Ry., Union Depot Bldg., J. Tuthill, Ch. Engr.—miscellaneous engine house equipment.

Mich., Detroit—The Walker Saxe Motor Car Co., 1525 Gratiot Ave.—garage repair equipment.

Mich., Detroit—Water Bd., 232 Jefferson Ave., H. S. Starkey, Secy.—repair shop equipment including lathe, cold saw, milling machine, etc.

O., Columbus—The Amer. Water Motor Co., 796 East 11th Ave., L. Lewis, Purch. Agt.—one lathe, about 24 in., one drill press, etc.

O., Warren—The Bd. Educ., c/o J. Buckwalter, Trumbull Blk.—equipment for manual training shop.

Wis., Milwaukee—The All Tite Chain Co., 231 27th St., F. Hoya, Purch. Agt.—punch presses, lathes and drill presses.

Wis., Milwaukee—The Bd. of Industrial Educ., 800 Manufacturers' Home Bldg., F. French, Secy.—watchmakers' lathes, precision bench, chucks, and screw cutting attachments.

Wis., Milwaukee—Greenfield & Co., 120 Wisconsin St.—machine tools for manufacture of printers' tools.

Wis., Milwaukee—The Petit Mfg. Co., 1439 14th St., A. Faudrich, Purch. Agt.—one medium sized miller and one large shaper.

Wis., Milwaukee—J. Wilging, 1358 33rd St.—one 30 in. planer.

Mo., St. Louis—The Missouri, Kansas and Texas Ry., Ry. Exch. Bldg., G. E. Scott, Purch. Agt.—about $42,000 worth of machine tools including drill presses, lathes, planers, power hammers and pneumatic tools.

Mo., St. Louis—The Pierre Investment Co., c/o R. S. Price, Arcade Bldg.—repair shop equipment.

Mo., St. Louis—The Terminal Ry. Assn. of St. Louis, Union Station, W. G. O'Fallon, Purch. Agt.—miscellaneous machine tools for Brooklin, Ill., machine shops, including lathes, milling machines, pneumatic tools, etc. Estimated cost, $12,000.

Tex., Palestine—G. E. Dilley & Son—one set of hand rolls for handling 48 in. sheets of 10 to 18 gauge blue annealed steel (used).

Cal., Los Angeles—A. J. Taussig, 827 Union Oil Bldg.—automatic press for manufacture of pencil caps.

Que., Montreal—J. Gilston & Co., Ltd., Wilson Ave.—garage equipment.

Que., Montreal—The Grand Trunk Ry., McGill Bldg., G. W. Caye, Purch. Agt.—machine tool equipment for new shop.

Machinery

The following concerns are in the market for machinery:

Ky., Louisville—The Kentucky Tire and Rubber Co., W. R. White, 502 Realty Bldg., Vice Pres.—machinery for manufacture of automobile tires.

La., New Orleans—The Arabi Packing Co.—complete equipment for packing house.

La., New Orleans—The Rex Motor Car Mfg. Co., 628 Gravier St.—wood and iron working machinery for Shrewsbury plant.

Ill., Chicago—The LaSalle Iron Wks., 2205 South Halsted St.—equipment for West Hammond, Ind., plant, including rolling mill, heat treating outfit and pickling equipment.

Ill., Chicago—The Chicago, Milwaukee and St. Paul Ry., Ry. Exch. Bldg., W. A. Lynn, Purch. Agt.—one 10 ton traveling crane for West Milwaukee, Wis., shops.

Ill., Chicago—A. Finkel & Sons, 1326 Cortland St.—machinery for heat treating plant.

Ill., Chicago—D. Levi & Co., West 40th St. and Packers Ave.—equipment for packing plant.

Ill., DeKalb—The Vassar Swiss Underwear Co., 2545 Diversey St., Chicago—knitting machinery.

Ill., Urbana—W. A. Conklin, 207 East Illinois St.—one doughnut machine with stove kettle and mixing bale.

Ind., East Chicago—The General Amer. Tank Car Corp.—foundry equipment.

Ind., Gary—The Universal Slag Brick and Tile Co.—$50,000 worth of machinery for new plant.

Ind., Indianapolis—The Parker Cord Fabric Mills—$50,000 worth of miscellaneous machinery for manufacture of fabric cord, including spinning and weaving machines.

Ind., Kendalville—The Wert Mfg. Co.—machinery for new plant.

Mich., Detroit—The Dept. of Pub. Wks., c/o Comm. of Purchases and Supplies—one 3 motor, electric traveling crane with trolley complete.

Mich., Detroit—The Ford Motor Car Co., Highland Park—sawmill and woodworking machinery for Iron Mountain plant.

O., Cincinnati—The Julian & Kokenge Co., 4th and Lawrence Sts., F. B. Dopp, Purch. Agt.—miscellaneous machinery.

O., Cleveland—The Independent Brick and Tile Co., The Arcade—one locomotive crane.

O., Columbus—The Atlas Bros. Fdry. Co., 980 South Park St., E. Wittman, Mgr.—miscellaneous foundry equipment.

O., Columbus—The C. & E. Shoe Co., 129 East Noble St., W. A. Hamilton, Purch. Agt.—miscellaneous equipment for shoe factory.

Wis., Milwaukee—The Badger Brass Co., 243 Lake St.—equipment for brass foundry.

Wis., Milwaukee—The Duplex Storage Battery Co., 537 Edison St., A. Schickel, Purch. Agt.—woodworking machinery.

Wis., Milwaukee—The Milwaukee Commercial Auto Body Co., 642 7th St., M. Schuster, Purch. Agt.—woodworking machinery.

Wis., Sheboygan—The Phoenix Furniture Co., South 12th St.—one monorail crane.

Wis., Wauwatosa—The Wauwatosa Sheet Metal Wks., 81 Vine St.—one stove pipe folder.

Ia., Davenport—A. B. Johnson Co., Brady St.—one hand power crane.

Cal., Georgetown—The Georgetown Lumber & Supply Co.—machinery for planing mill.

Ont., Ft. William—The Ft. William Pul and Paper Co.—equipment for mill.

Ont., Port Arthur—The Kaministiquia Pulp & Paper Co.—pulp mill machinery.

Ont., Toronto—The Grinnell Co., Ltd.—foundry equipment, including crane.

Metal Working

NEW ENGLAND STATES

Conn., Bridgeport—The Amer. Tube and Stamping Co., 471 Hancock Ave., will build a 1 story, 55 x 60 ft. factory with 30 x 40 ft. ell on Stratford Ave., for the manufacture of hot and cold rolled steel. Estimated cost, $14,000.

Conn., Bridgeport—The Bridgeport Machine Co., Beardsley St., will soon award the contract for the construction of a 1 story, 40 x 80 ft. machine shop. Estimated cost, $20,000. J. E. Stone, Canaan Rd., Stamford, Archt. Noted June 17.

Conn., Bridgeport—The Economy Mfg. Co., 886 Main St., plans to build a factory for the manufacture of spark plugs, on Brewster St. Estimated cost, $75,000.

Conn., Hartford—The city will soon award the contract for the construction of a 2 story, 50 x 125 ft. machine shop on John St. Estimated cost, $125,000. Whiton & McMahon, 36 Pearl St., Archts.

Conn., Hartford—The Hartford Automobile Club Garage Co., 36 Pearl St., will build a 7 story, 147 x 150 ft. garage, etc., on Hicks and South Ann Sts. Estimated cost, $500,000. Noted June 10.

Conn., Hartford—The Puritan Motor Sales Co., 334 Pearl St., will soon award the contract for the construction of a 1 story 50 x 140 ft. garage on Farmington Ave. Estimated cost, $40,000. Butler & Provoost, 292 Main St., Stamford, Archts. Noted July 1.

Conn., New Haven—The Fritzell Brass Fdry. Co., 33 Chestnut St., will soon award the contract for the construction of a 1 story, 50 x 150 ft. factory. Estimated cost, $40,000. Fletcher Thompson, Inc., 1089 Broad St., Archts. and Engrs.

Conn., New Britain—The Mendel Sicklick Co., 117 Willow St., will soon award the contract for the construction of a 2 story garage on Arch St. Estimated cost, $35,000. F. C. Walz, 348 Trumbull St., Hartford, Archt. Noted July 1.

Conn., Plainville—The Peck Spring Co., 68 Broad St., has awarded the contract for the construction of a 1 story, 40 x 50 ft. addition to its plant for the manufacture of springs. Noted Apr. 8.

Conn., Stamford—The Petroleum Heat and Power Co., Selleck St., has awarded the contract for the construction of a 1 story foundry at its plant. Estimated cost, $15,000.

Conn., Stamford—The Yale & Towne Mfg Co., 548 Pacific St., has awarded the contract for the construction of a 1 story, 60 x 262 ft. factory on Canal St., for the manufacture of hardware. Estimated cost, $16,000.

Conn., Stratford—The Spring Perch Co., Longbrook Ave., will build a 1 story, 30 x 100 ft. factory for the manufacture of automobile springs. Estimated cost, $10,000.

Conn., Waterbury—The E. J. Manville Machine Co., 574 East Main St., has awarded the contract for the construction of a 2 story, 50 x 200 ft. addition to its plant for the manufacture of machinery. Estimated cost, $65,000. Noted July 8.

Conn., Waterbury—The Waterbury Farrel Fdry. and Machine Co., 425 Bank St., will build a 1 story, 45 x 180 ft. addition to its plant for the manufacture of machinery. Estimated cost, $45,000.

Conn., Westport—The Westport Auto Sales Co. will soon award the contract for the construction of a 1 story, 65 x 165 ft. garage and sales room on Post Rd. Estimated cost, $45,000. J. E. Stone, Canaan Rd., Stamford, Archt.

Mass., Allston (Boston P. O.)—Tuck, Gilman & Sneider, c/o Tuck & Gilman, Archts., 34 School St., Boston, have awarded the contract for the construction of a 2 story 75 x 200 ft. garage and sales building, etc. on Fordham Rd. Estimated cost, $175,000.

Mass., Cambridge—The Mack Motor Truck Co., 185 Massachusetts Ave., will soon award the contract for the construction of a 1 story, 25 x 110 ft. addition to its garage. Estimated cost, $22,000. Warren & Gerrish, Cambridge, Archts.

Mass., Dorchester—The Byrne Realty Co., 435 Geneva Ave., will soon award the contract for the construction of a 1 story, 95 x 165 ft. garage on Holmes Ave. Estimated cost, $50,000. M. H. Maney, 16 Paisley Park, Archt. Noted July 15.

Mass., Everett—L. Albaum, 49 Malden St., will build a 1 story garage on Main St. Estimated cost, $20,000.

Mass., Holyoke—K. R. Charlton, Inc., 118 Race St., has awarded the contract for the construction of a 1 story, 110 x 110 ft. garage on Suffolk and Elm Sts.

Mass., New Bedford—J. C. Rhodes & Co., Inc., 123 Front St., has awarded the contract for the construction of a 4 story, 70 x 200 ft. factory on Front and 4th Sts., for the manufacture of eyelets. Estimated cost, $200,000. Noted July 22.

Mass., Springfield—The Brightwood Brass and Bronze Fdry., 365 Birnie Ave., will build a 1 story, 53 x 72 ft. addition to its foundry. Estimated cost, $20,000. Noted May 20.

Mass., Springfield—The M. S. Converse Co., 17 Harrison Ave., has awarded the contract for the construction of a 2 story, 40 x 62 ft. garage on Armory St. Estimated cost, $30,000.

Mass., West Springfield—The Springfield Automatic Screw Machine Corp. plans to build a factory. Estimated cost, $250,000. I. P. McGregor, Treas.

Mass., Whitinsville—The Whitin Machine Wks. will soon award the contract for the construction of a 5 story, 90 x 400 ft. addition to its plant, for the manufacture of machinery. Estimated cost, $600,000. J. D. Leland, 185 Devonshire St., Boston, Archt. Noted Apr. 22.

Mass., Worcester—The Worcester Pressed Steel Co., Barber Ave., will build a 2 story addition to its plant. Estimated cost, $25,000.

R. I., Pawtucket—The Pleasant View Realty Co., 400 Bway., has awarded the contract for the construction of a 1 story, 60 x 150 ft. garage on Bway. and Lupine Sts. Estimated cost, $35,000.

R. I., Woonsocket—The Bresnahan Grocery Co. has awarded the contract for the construction of a 1 story, 55 x 90 ft. garage on Pond St. Estimated cost, $25,000.

MIDDLE ATLANTIC STATES

Md., Baltimore—L. Blaustein, 612 Water St., has awarded the contract for the construction of a 2 story, 57 x 134 ft. garage at 609-613 North Fremont Ave. Estimated cost, $40,000. Noted April 1.

N. J., Kearney—L. Weil, Kearney Ave., will soon award the contract for the construction of a 1 story, 50 x 100 ft. garage. Estimated cost, $10,000. M. B. Silberstein, 119 Springfield St., Newark, Archt.

N. J., Newark—Koller & Goldstein, c/o H. Rosensohn, 188 Market St., has awarded the contract for the construction of a 1 story, 45 x 100 ft. garage at 294 Sussex Ave. Estimated cost, $10,000.

N. J., Newark—M. J. McGowan, 320 Market St., will soon award the contract for the construction of a 1 story, 50 x 100 ft. garage at 263 Lafayette St. Estimated cost, $10,000. R. Botelli, 207 Market St., Archt.

N. J., Newark—The Silidika & Shaftman Co., Lawrence and Commerce Sts., will soon award the contract for the construction of a 3 story, 60 x 100 ft. garage. Estimated cost, $15,000.

N. J., Trenton—The Orr Machine Guarding Co., East State St., has awarded the contract for the construction of a 2 story, 50 x 75 ft. factory on Calhoun St. Estimated cost, $30,000.

N. Y., New York (Borough of Queens)—The Hellman Motor Corp., c/o McEvay & Smith, Archts., Queens Plaza Court, L. I., has awarded the contract for the construction of a factory on Ely and Sunswick Aves. Estimated cost, $75,000. Noted June 17.

Pa., Philadelphia—The Electric Storage Battery Co., Allegheny and 19th Sts., has awarded the contract for the construction of several 1 story buildings on Rising Sun St. and Adams Rd.

Pa., Scranton—The Bour Refractories Co., Laurel Line and Front St., plans to build a 3 story, 90 x 200 ft. refractory on Stafford Ave. Estimated cost, $300,000.

SOUTHERN STATES

La., Shrewsbury (New Orleans P. O.)—The Rex Motor Car Co., 628 Gravier St., New Orleans, plans to build a 1 story plant here, to cover 7 or 8 acres. R. D. Soule, 429 Corondelet St., New Orleans, Archt.

MIDDLE WESTERN STATES

Ill., Chicago—The Ajax Forge Co., 2503 Blue Island Ave., has awarded the contract for the construction of a 1 story, 80 x 400 ft. and 65 x 200 ft. forge plant and a small boiler shop. Estimated cost, $300,000.

Ill., Chicago—The Delta Star Electric Co., 2437 Fulton St., will soon award the contract for the construction of a 1 and 2 story, 100 x 110 ft. addition to its plant on Fulton St. and Artesian Ave. Estimated cost, $40,000. R. G. Pierce, 10 South La Salle St., Archt. N. Ronneberg, 10 South La Salle St., Engr.

Ill., Chicago—A. Finkel & Sons Co., 1326 Cortland St., has had plans prepared for the construction of a 1 story, 32 x 98 ft. heat treating plant. Estimated cost, $20,000.

Ill., Chicago—H. S. Olson, 2056 Irving Park Blvd., has had plans prepared by E. N. Braucher, Archt., 6 North Clark St., for the construction of a 1 story, 50 x 125 ft. garage. Estimated cost, $25,000.

Ind., East Chicago—The General Amer. Tank Car Corp. plans to build a large addition to its brass foundry.

Ind., Hammond—The Union Railroad Equipment Co., 332 South Michigan Ave., Chicago, is having plans prepared for the construction of a 1 story, 75 x 125 ft. forge shop. Estimated cost, $125,000. D. Chase, Inc., 645 North Michigan Ave., Chicago, Engr.

Ind., Terre Haute—The Amer. Car and Fdry. Co. plans to enlarge its place.

Mich., Caro—Cooper & Strifflier has awarded the contract for the construction of a 1 story, 75 x 140 ft. garage and sales room. Noted June 24.

Mich., Detroit—The General Forgings Corp., c/o J. D. Edwards, 54 Lafayette Blvd., plans to build a 2 story, 65 x 210 ft. drop forging shop.

Mich., Detroit—The Walker Saxe Motor Car Co., 1525 Gratiot Ave., has awarded the contract for the construction of a 1 story, 119 x 135 ft. garage on Gratiot Ave. Estimated cost, $50,000. Noted June 3.

Mich., Detroit—The Water Bd., 232 Jefferson Ave., will soon award the contract for the construction of a 1 story, 90 x 120 ft. machine shop. H. S. Starkey, Secy., G. H. Fenkell, 232 Jefferson Ave., Engr.

Mich., Kalamazoo—R. E. Fair, Rose and Water Sts., has awarded the contract for the construction of a 2 story, 100 x 175 ft. Ford service station and storage building. Estimated cost, $110,000.

Mich., New Buffalo—The Pere Marquette Ry., Union Depot Bldg., Detroit, plans to build a 1 story engine house here, to have 16 stalls. J. Tuthill, Detroit, Ch. Engr.

O., Cleveland—The Laronge Co., c/o J. H. Dickman, 214 Williamson Bldg., is having plans prepared for the construction of a 1 story, 50 x 120 ft. garage on East 16th St. and St. Clair Ave. Estimated cost, $75,000. J. L. Weinberg, Schofield Bldg., Archt.

O., Cleveland—The Natl. Lamp Co., Nela Park, has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage on East 45th St. and Hough Ave. Estimated cost, $75,000.

O., Cleveland—W. D. Sixt, c/o S. H. White, Archt., 1032 Schofield Bldg., has awarded the contract for the construction of a 2 story, 60 x 110 ft. garage and sales room at 6820 Euclid Ave. Estimated cost, $100,000. Noted July 1.

O., Cleveland—The Waite Taxicab and Livery Co., 1467 East 6th St., will soon award the contract for the construction of a 2 story, 66 x 280 ft. garage on Superior Ave. near East 12th St. Estimated cost, $200,000. W. G. Ferguson Co., 1900 Euclid Ave., Archts. Noted May 13.

O., Warren—The Bd. Educ., c/o J. Buckwalter, Trumbull Blk., will soon award the contract for the construction of a 2 story, 125 x 150 ft. addition to the East Technical High School, to include a manual training department. Estimated cost, $400,000. R. J. Keich, Warren, Archt. Noted April 22.

Wis., Fort Washington—The Turner Mfg. Co. is having plans prepared for the construction of 1 story foundry. Estimated cost, $75,000. F. D. Chase, Inc., 645 North Michigan Ave., Chicago, Archt. and Engr.

Wis., Janesville—The Standard Oil Co., Waldheim Bldg., Milwaukee, is having plans prepared by B. M. Burt, Archt., c/o owner, for the construction of a 1 story, 60 x 120 ft. garage and warehouse on North Main St., here. Estimated cost, $40,000.

WEST OF THE MISSISSIPPI

Ark., Paragould—The Missouri Pacific Ry., 1055 Ry. Exch. St., St. Louis, Mo., has awarded the contract for the construction of a 1 story, 40 x 200 ft. car repair shop here. Estimated cost, $10,000.

Ia., Marshalltown—The C. A. Dunham Co., 343 South Dearborn St., Chicago, plans to build a 2 story, 40 x 150 ft. addition to its heating apparatus factory. Estimated cost, $150,000.

Minn., Minneapolis—The Russel Grader Mfg. Co., 2037 University Ave., S. E., is having plans prepared by E. R. Ludwin and Sund & Dunham, Archts., 512 Essex Bldg., for the construction of a 1 story, 424 x 600 ft. factory on Kennedy St. and Stinson Blvd. Estimated cost, $250,000. Noted Apr. 8.

Mo., St. Louis—The Pierce Investment Co., c/o R. S. Price, Archt. and Engr., Arcade Bldg., is having plans prepared for the construction of a 1 story, 175 x 200 ft. garage. Estimated cost, $150,000.

Tex., San Antonio—E. B. Flores, 112 East Mistletoe St., is building a 3 story garage on Travis St. Estimated cost, $75,000.

CANADA

Que., Montreal—J. Gilston & Co., Ltd., Wilson Ave., will soon award the contract for the construction of a garage. Estimated cost, $25,000.

Que., Montreal—The Hudon Hebert Co. Ltd., 18 De Bres St., will soon award the contract for the construction of a 2 story, 40 x 72 ft. garage on Papineau Ave. Estimated cost, $50,000. C. Dufort, 195 St. Catherine St., Archt.

General Manufacturing

NEW ENGLAND STATES

Conn., Hamden—The Yale Tire and Rubber Co., 961 Dixwell Ave., has awarded the contract for the construction of a 1 story, 40 x 90 ft. factory addition. Estimated cost, $15,000.

Conn., Rockville—The J. J. Regan Mfg. Co., 74 West Main St., has awarded the contract for the construction of a 1 story, 21 x 70 ft. addition to its finishing plant and a 1 story, 40 x 80 ft. dye house. Estimated cost, $16,000.

Mass., Chelsea (Boston P. O.)—The Walker Bros. Dyeing & Bleaching Co., Clinton St., plans to rebuild its bleachery on Bway. and Clinton St. Estimated cost, $50,000.

Mass., Chicopee Falls—The Chicopee Mfg. Co., West Main St., has awarded the contract for the construction of a 1 story, 150 x 250 ft. weave shed at its plant. Estimated cost, $130,000.

Mass., Fall River—The New England Oil Co. will build additions to its plant to consist of a 1 story, 17 x 25 ft. oil receiver house, 32 x 74 ft. oil condensers, 45 x 181 ft. oil stills, etc., along the Taunton River here. Estimated cost, $100,000.

Mass., Holyoke—The Hampden Glazed Paper and Card Co., Riverside, has awarded the contract for the construction of a 4 story, 92 x 291 ft. factory on Water St. Estimated cost $165,000.

R. I. Providence—The Franklin Process Co., 29 Promenade St., will soon award the contract for the construction of a 2 story, 110 x 175 ft. dye house. Estimated cost, $150,000. Lockwood, Greene & Co., 60 Federal St., Boston, Archts. and Engrs. Noted May 27.

R. I., Woonsocket—The Lafayette Worsted Co., Hamlet Ave., will soon award the contract for the construction of a 2 story, 140 x 250 ft. spinning mill. Estimated cost, $200,000. W. F. Fontaine, Federal Bldg., Archt. Noted July 22.

MIDDLE ATLANTIC STATES

N. J., Monmouth Junction—The Alcoholic Products Corp. has awarded the contract for the construction of an addition to its plant. Estimated cost, $50,000.

N. Y., New York (Borough of Brooklyn)—W. Wrigley, Jr., Metropolitan Ave., manufacturer of chewing gum, has awarded the contract for the construction of an 87 x 380 ft. addition to his plant. Estimated cost, $100,000.

N. Y., New York (Borough of Manhattan)—The Hill Ware Baking Co., 165th St. and Park Ave., has awarded the contract for the construction of a bakery. Noted July 1.

Pa., Johnstown—The Peris Products Co. plans to build a 2 story, 47 x 167 ft. factory on Sheridan Ave., for the manufacture of soap products. Estimated cost, $150,000. A. Peris, Ft. Stanwix Hotel, Pres.

Pa., Philadelphia—The E. B. Steinmetz Co., Inc., Huntingdon and Hancock Sts., will soon award the contract for the construction of a 2 story, 48 x 105 ft. yarn factory on Sedgely St. Peuckert & Wunder, 310 Chestnut St., Archts. and Engrs.

Pa., Scranton—The Edison Lamp Co. plans to build a 3 story, 100 x 100 ft. bulb blowing plant on Washington Av. Estimated cost, $200,000.

Pa., Scranton—The Scranton Button Co., 109 Cherry St., has awarded the contract for the construction of a 1 story, 85 x 85 ft. factory on Washington Ave. Estimated cost, $50,000.

SOUTHERN STATES

Ky., Louisville—The Kentucky Tire and Rubber Co. will soon award the contract for the construction of a factory for the manufacture of automobile tires. W. R. White, 502 Realty Bldg., Vice Pres.

La., New Orleans—The Arabi Packing Co. will soon award the contract for the construction of a packing plant, to consist of a 2 story, 100 x 198 ft. main building, 1 story, 57 x 67 ft. power house and a 2 story, 24 x 36 ft. reduction plant. Estimated cost, $400,000. The Packers Architectural Eng. Co., 431 South Dearborn St., Chicago, Archts. and Engrs.

La., New Orleans—The Presto Lite Co., 30 East 42nd St., New York City, has purchased a site on Anthony and St. Louis Sts., here, and plans to build a 2 story acetylene plant. Estimated cost, $200,000.

MIDDLE WEST STATES

Ill., Chicago—The Abbott Laboratories, 4753 Ravenswood Ave., will build a chemical manufacturing plant, including ten 1 story buildings, at 4800 Ravenswood Ave. Estimated cost, $225,000.

Ill., Chicago—D. Levi & Co., West 40th St. and Packers Ave., will soon award the contract for the construction of a 3 story, 115 x 170 ft. packing plant on West 39th St. and Emerald Ave. Estimated cost, $350,000. Henshein & McLaren, 37 West Van Buren St., Archts.

Ill., De Kalb—The Vassar Swiss Underwear Co., 2545 Diversey St., Chicago, is having plans prepared for the construction of a 1 story underwear factory. Estimated cost, $50,000. F. D. Chase, Inc., 645 North Michigan Ave., Chicago, Engr.

Ind., Indianapolis—The Parker Cord Fabric Mills plans to build a plant for the manufacture of fabric cord tires.

Mich., Detroit—The Michigan Creamery Co., c/o S. Raboniwitch, Ford Bldg., is having preliminary plans prepared by T. A. Hyland, Archt., 307 Moffat Bldg., for the construction of a 7 story creamery on Grand River St.

O., Cleveland—The U. S. Leather Co., c/o E. B. Cassett, East 13th St. and Euclid Ave., plans to build a 1 story, 100 x 300 ft. factory on Broadview Rd. Estimated cost, $100,000.

O., Cleveland—The Walter Ice Co., c/o A. C. Bishop, Archt. and Engr., Guardian Bldg., is having plans prepared for the construction of a 1 story, 45 x 146 ft. ice plant on West 25th St. Estimated cost, $75,000.

O., Middletown—The Advance Bag Co., 155 North Bway., has awarded the contract for the construction of a 3 story, 65 x 300 ft. paper mill. Estimated cost, $150,000.

Wis., Merton—The Merton Dairy Products Co. has had plans prepard by M. Tullgren & Sons, Archts., 425 East Water St., Milwaukee, for the construction of a 1 story, 45 x 70 ft. addition to its laboratory. Estimated cost, $35,000.

Wis., Pickett—A. H. Fortnum, c/o State Bank of Ripon, Ripon, plans to build a 3 story, 50 x 100 ft. canning factory and 2 story, 100 x 100 ft. warehouse here. Estimated cost, $75,000.

WEST OF THE MISSISSIPPI

Mo., Kansas City—The Kansas City Macaroni Co., 4015 Grand Ave., will soon award the contract for the construction of a 4 story, 50 x 100 ft. factory on Pacific and Campbell Sts. Estimated cost, $50,000. H. F. Brandenburger, 15 West 9th St., Archt.

Tex., San Antonio—E. Steves & Son, 704 East Commerce St., manufacturers of lumber, are building a 2 story factory. Estimated cost, $76,000.

Tex., Yoakum—The Yoakum Mill and Elevator Co. is building a 11 story mill and elevator. Estimated cost, $18,000.

WESTERN STATES

Cal., Georgetown—The Georgetown Lumber & Supply Co. plans to build a saw mill. J. L. Hasler, Mgr.

CANADA

Ont., Ft. William—The Ft. William Pulp and Paper Co. has awarded the contract for the construction of a 2 story, 400 x 600 ft. pulp and paper mill at the mouth of the Million River. Estimated cost, $1,000,000. Noted July 27.

Ont., Hamilton—The Firestone Tire and Rubber Co., Sherman Ave., has awarded the contract for the construction of a 4 story factory. Estimated cost, $500,000.

Ont., Port Arthur—The Kaministiquia Pulp & Paper Co. plans to build a pulp mill with 30 ton daily capacity. Estimated cost, $1,000,000. C. D. Howe, Port Arthur, Engr.

Ont., Sudbury—The Canada Creosoting Co. will build a 1 and 2 story plant. Estimated cost, $50,000.

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